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REPORTS FROM THE ANNUAL MEETING
(Part II)

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Announcement

CERTIFICATION OF SANITARY INSPECTORS IN CANADA

PURSUANT to the adoption by the Association of the report of the Committee on the Certification of Sanitary Inspectors at the annual meeting held in Toronto on June 3rd to 5th, 1935, examinations for the certificate (C. S. I. (C.)) to be granted by the Canadian Public Health Association will be arranged in various provinces next November or December. Definite announcement of the date of the examinations will be made in September.

A syllabus relating to the subjects of the examination with details of the requirements for registration, together with an application form, may be obtained by addressing Dr. J. T. Phair, Secretary of the Committee on the Certification of Sanitary Inspectors.

CANADIAN PUBLIC HEALTH ASSOCIATION
105 BOND STREET TORONTO 2, ONTARIO

CANADIAN PUBLIC HEALTH JOURNAL

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The Provision of Medical Care in Western Canada*

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SOME two weeks ago it was my privilege, tired in mind and body after an arduous week of trying to keep the various pieces of machinery in a health department functioning smoothly, to make my bed on a balcony of a cabin high up on the rocky shores of Ontario's beautiful Lake of the Woods. The croaking of frogs in a nearby swamp, the hooting of a night owl high up in the top of a pine tree, the eerie calling of the bush wolf from island to island, the laughing of a loon across the lake, and the shimmering of the moonlight on the quiet water only accentuated the charm, the beauty, the magnificence and the power of nature at rest; and, as my consciousness merged into the sub-conscious, I asked myself: Of what avail can the puny efforts of men be in directing or altering the laws of nature? The passing of night and the coming of a new day brought renewed hope that public health efforts might ultimately reach the ideal for which we all so earnestly strive.

If we are going to succeed, we must have an ideal. Our ideal, I think, should be the maximum degree of good health for every citizen of Canada. To attain this end we must consider not only the preservation of health and the prevention of illness, but also the cure of disease; and the last of these is not the least. Therefore, we all should have a real interest in the provision of medical services.

We in the West have much to thank the East for; and not the least of these is that practically all of the early pioneers, who settled our rural areas, were of eastern stock. Doctors drifted in with the others and settled wherever they thought a practice was assured, but the people were very poor and obtained medical attention only when the sick one was near death's door. The practice of medicine in the West appeared attractive and many graduates of eastern universities commenced on their life's work in a western setting.

In 1886 Manitoba College issued its first diploma and from that year on an adequate number of medical practitioners were available for the people

**Presidential Address delivered before a joint session of the Canadian Public Health Association with the Ontario Health Officers' Association and the Canadian Social Hygiene Council, Toronto, June 3, 1935.*

of the West. The peak of medical service, in so far as rural areas were concerned, was reached about the year 1912, at which time there was approximately one physician for every twelve hundred rural inhabitants in the province of Manitoba; and even comparatively isolated regions had medical attention available. From then until the present there has been a gradual reduction in the number of medical men willing to practise in rural areas, and, although there has been a steady increase in population, amounting in all to approximately 20 per cent in the last twenty-five years, the number of general practitioners in rural Manitoba has decreased to an even greater extent.

During the period of rising prices for farm products with increased income for the farmers, about the only individual who did not receive higher prices for his services was the family physician. This also tended to decrease the number of men willing to endure the hardships and more or less meagre living obtainable in a country practice. The cost of medical service to the individual increased by leaps and bounds due to the advent of new and more costly methods of diagnosis and treatment, and the great increase in the number and use of specialists. Under these circumstances many municipalities canvassed ways and means by which adequate medical services might be made available for their ratepayers. This resulted in the birth of the "municipal doctor" idea. The first municipal physician in Manitoba was engaged in 1919 and this particular type of medical practice has filled a real need.

The municipal doctor, both from the standpoint of treating disease and the prevention of illness, has been an outstanding success, and the benefits which have accrued to those municipalities which have had the service for a considerable number of years cannot be overestimated. We know that the municipal doctor soon becomes public-health-minded and finds that it is to his advantage to prevent disease. As a result, vaccination, toxoid administration, medical examination of school children, and the remedying of defects amongst the population, are routine procedures. The municipal doctor sees to this in order that he may be spared the necessity of attending people who might be ill as a result of not having had these services provided.

Notwithstanding the many advantages of the service rendered by the municipal doctor there would appear to be some disadvantages in so far as the provision of an adequate medical service is concerned. From the standpoint of a complete medical service the municipal doctor scheme does not meet the need. Practically every contract specifies that the services to be rendered are only those which the doctor can give in his own office or in the patient's home, which, of course, includes minor surgery but none of the special services which the public demand. As a result, the individual who requires for himself or his dependents surgery of various descriptions in hospital, still is under the handicap of having to pay for this out of his own purse; and, after all, it is usually this type of medical attention which is the most expensive and for which the individual is the least able to pay.

For many years there was no medical control whatsoever over the employment of a doctor for this type of work and in many municipalities the municipal authorities did not engage the best physician from those applying, but rather, in view of the fact that all medical men were licensed to practise medicine,

took this as a guarantee of quality and engaged the man who would work for the least amount of money. As usually happens in such cases, they got no more than they paid for and, unfortunately, this tended to throw discredit on the scheme.

Another disadvantage is the fact that a man on a salary basis is at the beck and call of every individual in the municipality who pays taxes, and thus there is likely to be, certainly at first, a great many unnecessary calls. As a result of this the doctor is prone to become suspicious of every call he receives, which, sometime, is bound to result in disaster. This point was very forcibly brought to our attention in Manitoba about a month ago when a municipal doctor refused to make a call on a child, although he had been requested to do so on several occasions. The child died of broncho-pneumonia without any medical attention, and although the coroner, at the inquest, stated that nothing could have been done to prevent the death, the police criticized the municipal doctor for his lack of attention. Instances such as this are few but one can readily see that a municipal doctor, with a large territory, unless he is prepared to work without giving thought to his own well-being, is bound sooner or later to neglect a call which may be important. But, notwithstanding any drawbacks which the municipal doctor scheme has, it fills a very definite place in the provision of medical services in Western Canada. This is evidenced by the fact that approximately one-third of rural Saskatchewan is provided with this service and in Manitoba some ten thousand people are being given medical care under this plan.

The need of more adequate medical service was evidenced very definitely by a health survey made in the province of Manitoba by the Department of Health and Public Welfare in 1928, which elicited the information that the one outstanding problem was the provision of a more adequate medical service for all the people at a price they could afford to pay. Organized medicine apparently had no inkling of the tend of public thought at that time, for when asked to appoint a committee to study state medicine in all its ramifications it threw up its hands in holy horror. How quickly times change!

This public agitation, together with the high cost of medical care to the individual and the apparent advantages in the municipal doctor system, has resulted in the investigation of the whole subject by commission or committee in three of the four Western provinces, and the statement in the other province by the Minister of Health that "consideration would be given to the formulating of some plan for the state provision of medical care."

In British Columbia an Act has already been prepared and after a year's consideration will likely be presented to the Legislature.

In Alberta within the year a plan of health insurance will be inaugurated in one area as a trial, in order that detailed information as to the cost and feasibility of the scheme may be obtained. In Manitoba some eighty thousand people are in receipt of a complete medical service of a modified type, which includes medical attention, hospitalization, surgery, dentistry and drugs. I refer to that group of people in receipt of unemployment relief. This service is provided and paid for by the municipality of which the individual is a resident. The individual requiring the service has the right to choose his

own doctor, hospital and drug store. The service provided by the medical profession on a fee basis is at cost, in view of the fact that it is paid for from taxes. The service itself is not supposed to include the treatment of chronic conditions; that is, conditions which the individual may have had previous to his enrolment as an unemployed person. It does include, however, a complete service for acute and sub-acute conditions, and where the remedying of a chronic condition would assist the man in obtaining employment, treatment is provided.

This service is under the direct control of members of the medical profession, the medical relief officer, together with the medical health officer, being responsible for the medical control of the service. In case of dispute or complaint, either from individuals or from members of the medical profession, which cannot be satisfactorily settled by the medical relief officer, it can be referred to a medical advisory committee which is composed of the medical officer of health, the medical relief officer, and two appointees of the Manitoba Medical Association's Committee on Sociology. This medical service has been in operation a year and three months and every patient has had the privilege of consulting a private physician of his own choice from a panel of doctors willing to render service. Records are kept showing the conditions treated, the time the individual was sick, and the cost of the treatment, including drugs and hospitalization. It is the hope of the Department of Health and Public Welfare that, during the present summer, a staff will be found available to investigate these records and tabulate the information contained therein. The cost of this service for the first year was approximately $5.75 per person, which included hospitalization, medical care, surgery and drugs. However, we must remember this service is obtained at cost and the above figure would have to be considerably increased to give a service for chronic conditions and to increase the fees enough to allow the doctor an adequate living.

We expect to have in operation sometime during this summer a complete medical service in one or two rural areas of Manitoba, so that a comparison can be made with the municipal doctor scheme and information obtained as to the actual cost of providing a complete medical service to people in rural Manitoba under the present fee system of medical practice. Any information as to the amount and type of illness in a community should be of the greatest value to us in indicating how and where our health protection efforts may best be directed; and should be of great value also in the consideration of a state system of medical care.

In Manitoba, as elsewhere, during all the changing years of medical practice there has developed within the province a fairly complete public health service. Everybody, of course, agrees that the ideal is to have all public health work done by a personnel who are specially trained, but under the present economic conditions in Western Canada, and probably as they exist throughout the whole of the Dominion, this is not practicable; and we think that the part-time service, particularly in rural areas, can be made to serve for the present quite successfully.

We all must agree that if public health work is going to take the place it should in our scheme of things it is necessary to have the whole-hearted support

of all the branches of medical practice, regardless of whether or not the health work is being done by specially qualified personnel. I know that it has frequently been said that the practising physician will not co-operate fully with the health department, but to this statement I want to make the most strenuous objection. When this occurs the fault does not rest with the medical profession alone but is due, in a large measure, to our not seeking the co-operation of the physician. We have always considered ourselves too much a group apart and have taken too little interest in the problems, both scientific and economic, of the practising physician until the belief has been developed by many of the profession that the establishment of an adequate public health service in any area is detrimental to private practice. As a matter of fact the reverse should be true, as many projects now being carried out by the health personnel could be more advantageously conducted by the family physician.

As I said before, the whole-hearted co-operation of the medical profession and the public health personnel is necessary for an ideal service, and this, we believe, can be obtained if the medical profession is properly acquainted with our work and is asked to assist in it. This has been very well demonstrated in many parts of the West, and in Ontario as well, for I venture to say that fully half of those present as health officers are also practising physicians. The medical profession, as a group, is only too eager to help gather information in reference to any disease which may be prevalent in the community, and if statistical information is to be correct we must rely on reports received from the practising physician, which, as a rule, are given very willingly.

In Manitoba we have had a maternal mortality survey in operation since 1929. This requires the filling out of a special questionnaire by the doctor in attendance on each death which, by any chance, might be classified as "maternal"; and in the first five years of its operation we found that there was only one questionnaire which had not been properly filled in and returned. The results appear to have justified the trouble taken in that the maternal mortality rate in Manitoba for 1934 reached the exceedingly satisfactory low level of 3.6 deaths per 1,000 live births. This has been made possible only through the co-operation of the practising profession with the health officials.

What, then, should be the attitude of organized public health towards the changing trend in the provision of medical services? Certainly we cannot afford to stand aloof and allow the matter to solve itself. Personally, I think public health officials should be the leaders in any worth while movement which has as its object the better provision of adequate medical service to every individual; and organized public health should be, at least nominally, the head of any medical organization required to take care of the state provision of such services.

In our experience with the municipal doctor system in Manitoba we know that if the provision of medical services is left entirely in the hands of the lay municipal officials the service is not so satisfactory as it should be from the standpoint of the patient, the municipality, or the physician; and we realize there must be some sort of efficient medical control in order that any scheme of medical service may be satisfactory.

This has also been proved in Manitoba's attempt to provide medical service for those in receipt of unemployment relief. We believe the ultimate provision should be an organization directly connected with, and possibly controlled by the health authorities; and that this control should be entirely medical, at least in so far as the supplying of the service, the type of service required, and the cost of rendering any particular piece of service, are concerned. We also believe that organized public health must go still farther in its attempt to preserve the health of the community by putting forward greater and more persistent efforts in post-graduate teaching amongst the medical profession in order that the prevention of disease and the preservation of health will receive the attention they deserve. Until this is done we will always find a certain amount of resentment expressed by a percentage of those practising medicine. We must remember that the promotion of health in a community depends entirely on the preservation and promotion of health in the individuals composing the community, and this can most satisfactorily be brought about by the family physician.

We think that with a proper system of the so-called "state medicine" or "health insurance" the family physician will be in an excellent position to carry out the aims and objects of organized public health, as the supplying of medical service will not then depend on the individual's ability to pay and he will seek attention in the initial stages of illness. It is only a step from this point to having the individual seek the advice of his physician while well, in order that he may remain well.

In my opinion the ideal which we, as public health officials, wish to reach will be attained much more satisfactorily and much more rapidly when there is instituted, with the co-operation of organized medicine throughout Canada, some well-rounded plan for a complete medical service for all in every community.

In conclusion, might I remind you that the preservation of the health and the well-being of a nation is no new thought in the minds of statesmen, as is evidenced by that quotation from one of Disraeli's celebrated addresses, which reads as follows:

> "Public health is the foundation upon which rests the happiness of the people and the power of the State. Take the most beautiful kingdom, give it intelligent and laborous citizens, prosperous manufactures, productive agriculture; let the arts flourish, let architects cover the land with temples and palaces; and in order to defend all these riches, have a first-rate navy and a powerful army—if the population remains stationary, if it decreases yearly in vigor and in stature, then the nation must perish. And that is why I consider that the first duty of a statesman is the care of the public health."

This duty is especially applicable to us. We must always remember we are the appointed health workers for the people of Canada. All our training has been such that good health for the public must be our life's ambition; and if we believe that some system of state medical care is in the best interests of the health of every Canadian citizen, then it is our duty to assist in every way possible the state and the medical profession in formulating a plan so that the utmost may be obtained in the care of the sick, the prevention of disease, and the promotion of the public health.

Evaluation of Health Hazards in Industry

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WE are all concerned about any conditions which will shorten our lives and, where the relationship is clear, we demand that something be done about it. Those conditions which shorten life abruptly, such as accidents or acute diseases, are recognized by all classes. There, however, are other factors which shorten life whose influence is not so apparent, such as the personal habits of the individual and the nature of the environment under which he lives and works.

During the working period of his life man is exposed to conditions which are more or less beyond his control. These conditions may result in accidents, poisoning, and infection from materials handled or from other workers. On the other hand, conditions in the factory may be considerably better than in the home and be uplifting both mentally and physically to the worker.

Of special interest are those diseases which workers contract due to their industrial employment. Some of these diseases are the same kind that affect the general population, and others are more or less specific to industry. Very often the terminal illness is of a type suffered by the whole population superimposed on an industrial disease.

Industrial diseases can be either acute or chronic in nature. Acute cases of poisoning are probably fairly common in industry but are not always recognized as such, while chronic cases are seldom recognized unless the workers or management or both are aware of the potential danger of the materials handled. Frequently advanced cases of industrial diseases are not recognized in the large hospitals which, while not lacking in facilities for the diagnosis of ordinary illnesses, fail because the patient's occupational life is not thoroughly investigated.

In the evaluation of an industrial hazard, information concerning materials used in the plant is necessary. This is usually obtained from the man in charge and at this time other information such as the amount of sickness, labour turnover, etc., is ascertained. The attitude of the management towards their employees is of importance. While most employers are honest in their endeavours to promote healthful working conditions in their factories, some seem to be more conversant with their employees' personal habits outside the factory than they are with their own business. Very often a man of this type is operating a factory in which dangerous materials are used. His quickness to blame the employee's bad habits for any sickness that may result, makes one suspect that he is making the wish the father of the thought. There are a few employers who steadfastly refuse to believe that anything they use in their factory would cause sickness, although they are probably quite unaware of the chemical nature of the materials employed. This type

of employer is a real hazard when dangerous substances are used, as no amount of information or trouble affects his understanding. Very often the employer is loath to believe that any trouble has occurred in his plant because he has not recognized it. Just why an employer should adopt the attitude that he should be able to recognize industrial diseases even when he is not particularly looking for them is rather hard to understand. Another thing that is difficult to explain to the employer is why one man goes down and the man working next to him is not affected. Individual susceptibility is as hard to explain in connection with industrial diseases as it is with other diseases and invariably leads to the employer's assuming that the fault is in the man rather than the plant. Often the management is unable to tell you the chemical nature of the materials being used. Industry is more concerned with performance than chemical composition, and daily uses materials *the chemical nature of which it is ignorant.* To overcome this situation the Ontario Government has made regulations under the Factory Act requiring the labelling of materials used in industry which contain certain dangerous substances such as lead or benzol.

While the employer gives you one side of the story, the employee gives the other. Frequently the employee blames factory conditions for ill health when it is due to other causes. From the employee, however, an idea of the labour turnover, the amount and type of sickness, and whether a friendly relationship exists between the employer and employees may be gained. The general appearance of the worker is worth noting, as many industrial diseases affect the blood, producing changes in complexion. Generally speaking, the older the worker the better he is able to withstand industrial poisons. Females are usually more susceptible to serious damage than males. Lead poisoning in the female affects reproduction and is considered by many a race poison.

Most cases of industrial poisoning are caused by the breathing into the body of poisonous materials. From this it can be understood that the amount and kind of particulate and gaseous material in the air is of first importance in the evaluation of a health hazard. The fact that industrial diseases are largely air-borne puts the responsibility for control and prevention on the employer rather than the employee. Materials borne by air which cause industrial diseases can be divided into dusts, gases, and fumes.

DUSTS

Dusts consist of relatively large quantities of finely divided particles of such a size that they may be carried by air currents or winds. The size of the individual particle varies roughly from 150 microns to less than one micron. As only dust particles over 60 microns in size are ordinarily visible to the naked eye, the presence of a dust hazard is not always apparent and very often this leads to a feeling of false security when conditions are bad.

Industrial dusts may be classified as poisonous, those producing local irritation and those considered to be relatively harmless. In this paper only those dusts known to be definitely poisonous will be considered.

For the purpose of finding out whether any dust is poisonous one must

know the chemical composition of the materials from which the dust is being formed. Its determination always requires considerable laboratory work and is sometimes impossible.

After finding out that a poisonous material is being used, the next step is to decide whether or not a sufficient amount of dust is present in the air to cause trouble. The method of investigation depends entirely on the type of poisonous materials used. The two commonest poisonous dusts in industry are produced from lead and its compounds and compounds of silicon. In the case of lead poisoning it is the amount of lead material in the air that is important, while in the compounds of silicon it is the number and size of particles that are of chief concern.

Lead

Wherever lead or its compounds are used, some danger exists, due to the fact that lead is a cumulative poison. In Ontario, wherever lead is used it is required that a poster, warning the workers of the danger of lead poisoning, be displayed. Where conditions are sufficiently bad to warrant it, periodic examination of the workers is required. By this means individuals showing a high degree of lead absorption are removed from exposure. Where there is a lead hazard one seldom sees the continuous presence of visible dust in the air because such conditions would be so injurious to the worker as to make continuance of the industry almost impossible. Here other methods to estimate the hazard are used. If the materials are confined to enclosed systems the hazard will be largely to the persons putting the materials in and taking them out and cleaning the apparatus. If the material is used in a wet form the risk is less. People using lead in powder form are very apt to inhale considerable dust and should wear a mask. Wet lead products allowed to dry on floors, machinery, etc., contribute much lead dust to the air. Spraying with paints having a high lead content is always hazardous. One of the most important things in evaluating a lead hazard is to gather dust from places of lodgment near and around where the lead is being used. If lead is present in this dust you can be readily assured that a hazard exists. This method, while not nearly so impressive to the layman as the taking of air samples, often gives more information. When air samples are needed it is our custom to use the Greenburg-Smith impinger to collect the sample. In industries where operations are similar and continuous, air samples give a fair idea of the amount of lead breathed. Unfortunately, a great many of the lead exposures vary from time to time and the air sample only represents the lead content at the time of sampling. Even two men doing the same kind of work, soldering, for instance, may produce markedly different amounts of lead in the air. In lead pots the temperature of the lead and the amount of dross in the pot and the degree of ladling will influence the amount of lead in the air. Two milligrams of lead per ten cubic meters of air will, over a long period of time, cause lead poisoning in certain individuals. Very often where lead is used extensively it is difficult to keep the amount below this level. Here medical service and the use of masks are indicated.

Silicon

While the inhalation of certain silicon compounds in suitable state of division has been known for some time to produce a typical fibrosis of the lung, it is just being realized that these compounds produce systemic effects such as blood changes and increased mortality from disease of practically every other organ. This is rather disconcerting, for most of our present understanding of the disease silicosis, as a health and economic problem, has been linked with damage to the lungs usually complicated with tuberculosis. As silicious material constitutes around 60 per cent of the earth's crust, it can be readily appreciated that its occurrence in materials used in industry is very widespread. While silicon dioxide is considered to be the most frequent cause of the condition silicosis, evidence is being brought forward that other compounds of silicon may also produce fibrotic changes in the lungs. Our knowledge regarding the toxicity of the various silicates is by no means complete. We do know, however, that men exposed to silicon dioxide dust develop silicosis. Thus the silicon dioxide content of materials used in industry is of practicable value in estimating a hazard.

Where silicon dioxide is used in nearly pure form such as quartz, sand, diatomaceous earth, etc., there is no difficulty. Unfortunately great quantities of materials are used in industry that are natural in origin and contain a complex mixture of silicon compounds. While chemical examination will reveal the amount of the element silicon in the mixture, it does not necessarily indicate the manner in which it is combined. Very often it is necessary to consult geological surveys of the district from which the materials were derived and in some cases petrographical examination of the materials is necessary. This extensive enquiry, necessitating excursions into the fields of geology, petrography and chemistry, complicates the problem. Often despite all available information it still remains a speculation as to the chemical composition of the silicon compound being used or produced. The production of silicosis is probably the most important single piece of evidence indicating that the materials used contain silicon dioxide. For this reason, when any doubt exists as to the nature of a chemical composition of a dust, medical examination of those exposed is indicated. An examination giving negative results, however, is of little value unless a large number of people with long exposures be examined. This is not practicable where the labour turnover is high.

The Value of Dust Counts

The use of dust counts is sometimes of real value in estimating a dust hazard. When the amount of dust in the air is heavy, such as in sandblasting, rock crushing, etc., the taking of dust counts is really superfluous, as any one with industrial experience would know that a real hazard existed. The difference in susceptibility of those exposed would more than offset the value of taking dust counts over estimating the dust by the nature of the process and the visual appearance of the atmosphere. It must be remembered that if much visible dust is present in the air one can be reasonably sure that fine invisible particles under ten microns (the size that produces silicosis) will be

present in large amounts. However, if no visible dust is present one cannot say whether a dust hazard exists. Here the taking of dust counts is indicated if one has had no previous experience with similar situations. Even when processes are kept wet, enough dust may be generated to create a hazard. Men using a well wetted sandstone wheel, with no visible dust in the air, may get silicosis. In many occupations it takes from twelve to forty years to develop silicosis. During this long period the dust breathed by the workers will vary from hour to hour, from day to day, and from year to year. The taking of a few fifteen-minute air samples and the counting of the dust particles will not give the absolute exposure of an individual who has taken thirty years to develop his trouble.

It is often necessary to do dust counts in order to convince employers. Very often an employer will doubt your opinion on a hazard, but will readily accept and abide by a report containing dust counts, although he does not really appreciate their significance. Dust counts are of value for records or for comparing conditions with other observers and for evidence in legal proceedings. In the one situation where dust counts are of the greatest value they are seldom used, namely, as a guide in estimating the value of changes in methods and equipment instituted to suppress dust. Dust counts made before and after the change are the only feasible method of ensuring that the change has really effected an improvement or has made conditions safe. Dust suppression is really a problem for the engineer, and while many engineers are engaged at this work few of them realize the danger of fine silica dust. The number of engineers in Ontario who have actually done a dust count could, I think, be counted on the fingers of one hand. Every year much money is spent by industry on ventilating apparatus to make air conditions better for the workers. Very little effort is expended, however, to find out whether these changes are worth the money spent on them. Often neither the management nor the man who designs and installs the equipment is in a position to test it.

FUMES AND VAPOURS

Fumes and vapours, unlike dusts, are seldom seen, sometimes felt and often smelt. Some vapours can scarcely be detected by any of our senses. Thus the evaluation of a fume or vapour hazard is often difficult and sometimes impossible unless recourse is made to chemical analyses of the air or medical examination of workers, or both.

There are many people who think that the toxicity of a substance is in direct proportion to the offensiveness of its smell. This is not so. The odour of benzol is no more disagreeable than its much safer substitute, toluol. Carbon monoxide and hydrocyanic acid gas scarcely affects our sense of smell at all.

For convenience, vapours and gases can be divided into four classes according to the manner in which they make their presence known:

I. Those vapours or gases that cannot be smelt or seen and are not irritating.
II. Those that draw our attention by their appearance; *i.e.*, are visible.
III. Those that make their presence felt by their irritating action.
IV. Those that make their presence known through our sense of smell.

Class I

In class I are, for example, carbon monoxide, hydrocyanic acid, mercury vapours and many others.

While carbon monoxide poisoning may be responsible for many deaths outside of industry, it is not the cause of much trouble in industry. The hazard usually can be recognized by the nature of the work carried out in the factory and it can most easily be evaluated by examination of the blood of the exposed workers for carbon monoxide haemoglobin. Concentrations of carbon monoxide high enough to cause immediate trouble are not frequent in industry except in such places as steel plants.

Hydrocyanic acid gas or prussic acid is the gas which fumigators use for disinfestation. It is usually made by placing a cyanide salt in an acid solution. It is not used as such in industry but may be evolved from cyanide compounds under certain conditions. For this reason, where cyanide compounds are used in industry the ventilation should be good and the workers informed of the potential danger of the materials used.

Mercury vapour is given off from metallic mercury. One milligram of mercury vapour inhaled daily over a period of some months may cause poisoning. People exposed continuously to mercury should be under medical supervision.

Class II

The most important vapours in class II that will attract attention by their visibility are nitrous fumes. Nitrous fumes are brownish to black in colour when present in visible concentration. They are apt to occur whenever nitric acid is used. Materials like celluloid, gun cotton, etc., when slowly burnt or oxidized, give off these fumes. Solutions of nitrites as used in dyeing cotton may, under certain conditions, give off nitrous fumes in concentrations large enough to cause death. Nitrous fumes, although slightly irritating, can be breathed in fatal concentrations without any appreciable discomfort. Of all the poisonous fumes these are the most insidious; no distress is usually experienced until twenty-four hours after the exposure. The result is often fatal, the true cause of death being seldom ascertained. Nitrous fumes should be controlled by exhaust systems.

Class III

In class III are those gases which make their presence felt by their irritating action. While most of these gases are very toxic, even in small concentrations, their irritating effect is so great that no one would voluntarily enter or remain in a room which contained a dangerous concentration. When trouble occurs it is usually the result of an accident—a pipe or a container breaking in a confined space producing a lethal concentration in the air before the occupants can escape. Ammonia, sulphur dioxide, chlorine and phosgene are examples of irritating gases. Wherever these materials are used or produced in large quantities protective masks should be available for use in case of failure of equipment. Where small amounts of irritating gases are emitted

into the workroom, good ventilation is necessary. Phosgene is a very irritating and dangerous gas. It may be liberated by the decomposition of trichlorethylene and carbon tetrachloride.

Class IV

In this class there are a host of vapours and gases, and lucky is the investigator who has a good sense of smell, for he may be able to smell trouble without seeing it.

In this group are benzol and other coal tar products, two rather recent acquaintances trichlorethylene and carbon tetrachloride, gasoline and other petroleum products, hydrogen sulphide and many others.

All solvents, diluents and lacquers, cleaning fluids used by dry cleaners, paints, rubber cements, and many other products contain volatile substances which can often be recognized by their odour. In the case of lacquers there is usually a mixture of volatile substances, making exact recognition by this method difficult.

Volatile substances are used in such preparations on account of their solvent action and mixing properties and due to the fact they are rapidly volatile at ordinary temperatures. This means that they evaporate into the air of the workroom to an extent governed only by the method of application and system of ventilation employed.

Many of the substances in this group have anaesthetic properties when inhaled in high concentration. It is obvious that a concentration high enough to produce anaesthesia is encountered in industry only as an accident. It is the small amount inhaled day after day, without much apparent affect, which constitutes the serious industrial problem.

Benzol or benzene must not be confused with benzine, the petroleum product. Benzol is often a constituent of rubber cements, leather dope and cements, lacquers, thinners, paint removers, and such substances as plastic wood. In the case of benzol, men daily exposed to a concentration as low as 100 parts of vapour per million parts of air are very likely to show some damage to the blood-forming organs. In evaluating a benzol hazard one must bear in mind that it is the continued use of benzol, even in small amounts, that is likely to cause serious trouble, and not the occasional use of larger amounts. Thus a painter who uses paint remover, which usually contains benzol, does not get into trouble if his exposure is limited to this source. Sometimes it is very difficult to draw the line between continued and occasional use. Men daily exposed to benzol vapour should be under medical supervision. In Ontario the law requires that industrial materials containing benzol must be labelled to that effect, and provides when necessary for medical supervision of workers exposed.

The use of trichlorethylene and carbon tetrachloride is increasing. Both these materials are becoming extensively used in dry cleaning plants, replacing inflammable materials such as gasoline and other petroleum hydrocarbons. Trichlorethylene as a degreaser is finding a real place in industry for cleaning metal objects. Carbon tetrachloride is often used in fire extinguishers and in

rubber cements. The vapours of both substances are much heavier than air. While we are well aware that these vapours are poisonous in high concentration, we are at the present time unable to say just what will happen from continued exposure to small amounts. Men exposed to carbon tetrachloride often complain of stomach trouble such as nausea which persists for some time even after removal from exposure. Visual disturbances also have been reported. Both these substances are very volatile and quite expensive and means for the recovery of the vapours are used for economic reasons. If ever these substances become very cheap and their use in open systems is economical, trouble might ensue.

Gasoline, although largely used, does not seem to create a serious health hazard. In high concentration gasoline vapour will cause anaesthesia and death, but this concentration is seldom encountered in industry. Toxic concentrations of gasoline vapours are occasionally encountered in confined quarters: as when gasoline leaks from storage tanks and pumping machinery or is accidentally spilled in the underground rooms of gasoline storage and service stations. Men employed in cleaning the interior of tank cars or storage tanks which have contained gasoline or crude oil are particularly liable to poisoning unless precautions are taken. The introduction of tetraethyl lead into gasoline creates a lead hazard both from inhalation and absorption through the skin.

Hydrogen sulphide is one of the important hazards of the chemist, and many chemists have suffered from this injurious gas. Dangerous concentrations of this gas may occur in tannery vats, fat rendering plants, glue factories and sewers. In low concentrations it makes its presence known by its characteristic rotten egg odour; in high concentrations by its irritating effect. Very often people exposed to this gas suffer from sore eyes and photophobia. Few people seem to appreciate that hydrogen sulphide is very poisonous. Its lethal dose is about the same as hydrocyanic acid gas.

A very important factor always to be taken into consideration in evaluating the hazard of a particular job is the amount of physical labour performed by the worker exposed. As I have mentioned before, from a practical viewpoint industrial diseases are air-borne. Any factor which increases the amount of air breathed increases also the dose of injurious substances entering the body. The effect of muscular exercise on pulmonic ventilation is well known. Heavy work might easily increase pulmonary ventilation four to five times that required for sedentary work. A miner shovelling thirty tons of rock per day would receive a much higher dose of dust than a foreman standing idly by. Very often what is considered individual susceptibility can be accounted for by increased work done by the individual exposed. This fact explains why industrial diseases attack workers instead of executives when the exposure appears to be the same. The use of machinery for doing the heavy work unfortunately often creates additional dust and nullifies its beneficial effect of reducing manual labour.

A Basis for the Control of Tuberculosis in a Defined Area*

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THE problem of treating tuberculous disease and the prevention of tuberculosis, as applied to any given community, must vary with the district which is being served, although the principles of treatment and prevention should be essentially the same. There has been such a marked decrease in deaths from tuberculosis since the beginning of the present century that perhaps the machinery which was in operation then may not suffice for present needs. It is also quite probable that to-day's machinery will be inadequate twenty years hence; in the meantime, however, we must use the knowledge we have at hand. In the Niagara Peninsula we have attempted to follow a definite plan, although, in common with others, our work has been limited by the funds available for it.

The Niagara Peninsula Sanatorium serves the counties of Lincoln and Welland. This territory is bounded on three sides by Lake Erie, the Niagara River and Lake Ontario. On the west we are adjacent to territory which has been admirably served for some thirty years by the Mountain Sanatorium at Hamilton.

In this area we have a population of 138,000, of whom 24,000 live on farms. The largest of three cities in the district has a population of 26,000. There are a number of smaller industrial centres situated in the county of Welland, with a considerable foreign-born population. In each municipality a medical officer of health renders part-time service.

Our institution had its beginning in 1909, when a small sanatorium was opened in St. Catharines. This was really a retreat for far-advanced cases of pulmonary tuberculosis and was the only anti-tuberculosis effort until the Board of Health in St. Catharines started a bi-monthly chest clinic in 1922. Dr. Holbrook of the Mountain Sanatorium initiated this and staffed it until 1927, when, through its service, certain salient facts were revealed, namely, that clinics were being held too infrequently to serve even a small portion of the district, and that sanatorium facilities were entirely inadequate from the standpoint of available beds and proper equipment.

In 1927 the Board of Governors of the St. Catharines Sanatorium decided to place a full-time clinician in charge and provide extension clinics, so that both Lincoln and Welland Counties might be well looked after. They also decided to build a modern sanatorium in a location which would be central in the two counties. A new sanatorium was erected and opened in 1930. It has a capacity of 84 beds and is equipped to take care of all except cases of

*Presented before a joint session of the Canadian Public Health Association and the Canadian Tuberculosis Association, Montreal, June, 1934.

major surgery. A patient requiring abdominal surgery is referred back to the general practitioner who sent the patient in, and major chest surgery is sent to Toronto or Hamilton. On the staff we have two full-time clinicians, a part-time otolaryngologist and a part-time dentist, also a surgeon to take care of our cases of intrapleural pneumolyses, when indicated. Our nursing staff consists of graduate and undergraduate nurses. There are two training schools in the district and each nurse-in-training spends two months of her senior year on the wards of the sanatorium. The sanatorium staff co-operates with the training hospitals by examining each nurse-in-training during her probationary period and again during her senior year. Each examination includes x-ray. The affiliation of training schools with sanatoria should be encouraged. It assures each nurse of a careful chest examination at a time when her course is nearing completion, affords her an opportunity to study and nurse cases of tuberculosis, and, from a community standpoint, is an educational advantage of no small consideration.

Clinics

In 1927 weekly chest clinics were started in St. Catharines and Niagara Falls, bi-monthly in Welland and monthly in Port Colborne. Since 1930 a daily clinic has been in operation at the sanatorium. The sanatorium clinic serves that portion of the peninsula not served by the extension clinics noted above. By this means no patient has to travel more than twenty miles for examination, and for the greater part of our population clinic facilities are practically at their door. Our policy has been to examine only those cases referred by the family physician, who is always willing to co-operate with the public health nurse in gathering in contacts and known cases of tuberculosis in the community. As the occasion arises, all cases needing x-ray are referred to the sanatorium for this examination. In three centres the clinics are held in the hospitals, where x-ray facilities are available, but are not at our disposal for doing free chest work. Following each examination a full report of the history, physical and x-ray examinations, diagnosis and recommendations for treatment, is sent to the physician who referred the case. If the case needs follow-up work, a copy of the diagnosis and recommendations is sent to the nurse in whose district the patient has residence.

Clinic Finance

In each centre where a regular clinic is held, the local Board of Health contributes to the part-time service of the clinician. The x-ray work at the sanatorium, is, for the most part, free for tuberculous and contact cases. However, there are always some who can pay, and these patients are charged on a sliding scale, according to their means. In this way we are able to recover the cost of material, but the cost of personnel and depreciation remains a deficit.

Policy

As outlined above, an attempt is made to include the family physician in every phase of the work. In each newly discovered case, if infective, every

effort is used to break the contact with the family by admitting the patient to the sanatorium. In the case-history a careful social history is included and an assay of length and massiveness of exposure is established. This has a distinct relationship to the follow-up work.

All contacts are examined and in each case an attempt is made to find the source of infection, as well as those who have been infected. The examination of children includes tuberculin tests using increasing doses to a maximum of 1 mgm. of old tuberculin on all negative reactors. All positive reactors among children are x-rayed. X-ray is included with examination of all adult contacts.

Re-examination of contacts varies according to (1) age of individual, (2) period and massiveness of infection, and (3) x-ray findings and symptoms noted at the first examination.

Children under 2 years of age who have a positive tuberculin test are observed carefully at intervals of 6 to 12 weeks. A short history and fluoroscopic examination usually suffice. X-ray is indicated when symptoms are present, or when change is noted on fluoroscopic examination. The child under two years showing parenchymal infiltration, in most instances, should be in hospital.

Children over 2 years of age showing childhood type of disease, in the nature of soft parenchymal infiltration on x-ray, are seen at intervals of one month until such time as there is x-ray evidence of stabilization or resolution. After that, they are seen at intervals of from 2 to 4 months. During the course of this observation these children are maintained in bed at home, if home conditions can be made suitable for treatment. Children who show unstable lesions should be admitted to hospital.

Children with positive skin tests and, possibly, evidence of calcification on x-ray, but who are symptomless and do not show x-ray evidence of soft lesions in the parenchyma, are seen at intervals of from 3 to 6 months for the first 2 years after contact is broken. As they favourably recede from the period of exposure, they are seen at intervals varying from 1 to 3 years until the age of adolescence. During these later years the fluoroscope is used to assist in examination, unless symptoms, physical signs, or fluoroscopic examination indicate x-ray. Physical defects of a non-tuberculous nature are reported to the family physician for correction.

During the first three of our six years of rather intensive work it was not possible to x-ray all childhood contacts. During the last three we have had adequate x-ray facilities and it has been interesting to note how many more cases of childhood type of tuberculosis have been discovered, and yet our death rate in the age-group of two to fifteen years has been low, indicating that general health measures during this time are probably the most essential factors in treatment.

With adolescents, examinations, including x-ray, are continued at yearly intervals. At the earliest evidence of infiltration patients are watched more closely and are placed on a régime of rest treatment. Examinations are repeated at intervals of 6 weeks to 3 months. Perhaps our greatest mistake is to spend too much time examining children between the ages of 2 and 12,

when they are least likely to develop the type of tuberculosis which kills. It is during the period of adolescence that they most need our help.

Extent of Work

During the year 1933 we examined 2,263 cases at our clinics and of these 1,053 were patients seen for the first time. Of the new cases 13.1 per cent were diagnosed as active. In 1932 we saw 1,002 new cases, 15 per cent of whom were diagnosed as active.

In 1930 when the new sanatorium was opened, we admitted 20 patients from our former sanatorium and 25 patients from the district who were being treated in the Mountain Sanatorium at Hamilton. Another 20 cases admitted from the district had previously been diagnosed and were on our active clinic records. These were quite willing to go into hospital, but could not be persuaded to go as far from home as Hamilton, which is 40 miles distant. I believe the sanatorium which gets the greatest percentage of active cases within its doors for treatment is the one which is situated close to the population which it serves. This statement is further borne out by the fact that in 1933, when, of the 114 new active adult cases, 95 were advised to take sanatorium treatment, only 4 refused to come in. Since that time 2 of the 4 have been admitted. The physicians of our district have allowed us to use our discretion in persuading patients at the time of examination to take sanatorium treatment.

Follow-up Nursing Service

The follow-up work must include both nursing and social service activities. In a large centre these services are available and can be efficiently applied through co-operation. In rural and smaller urban centres, however, they must be developed as a unity, with the visiting nurse as guide.* As a matter of routine, we have, for the past year, taken a careful social history of all newly diagnosed cases and it has been extremely useful. Our follow-up nursing service has developed gradually. With each extension clinic we have the part-time service of the public health nurse of the municipality concerned. Although patients from outside the municipality are received for examination, the nurse's activities are restricted to the municipality by which she is paid. For that reason, an attempt has been made to organize all the public health and school nurses of the district to assist us. We have 14 of these assistants.

Each nurse in the district has received a list of and a report on all known cases of tuberculosis, or contacts, in her municipality, with recommendations regarding further examination and treatment. This list includes contacts of patients who have died of tuberculosis outside the sanatorium and who have never been examined at clinics, nor had sanatorium treatment. The school and public health nurses do the follow-up work on all families in their territory. Industrial nurses relieve them somewhat by doing a similar piece of work for families whose breadwinner is in their employ. Nursing and social service

**Since this paper was written the Sanatorium Board employed a second public health nurse early in 1935, so that we now have one nurse working full-time in the County of Lincoln and one full-time in the County of Welland.*

histories are maintained on all cases by the nurse in charge and a summary of this work is sent to the sanatorium nurse, where a complete record of all tuberculous cases in the district is maintained. The sanatorium nurse is responsible for this constant checking and has her own territory to cover, as well.

Frequency of nursing visits depends on various factors, such as home environment, the mentality of the family, and medical recommendations following clinic examination. Frequent visits are necessary if the mentality is low, or if there is a positive sputum case being treated in a home where there are children. The principle of this work always should be to pick out defects in living, housing, diet, and to teach responsible members of the family the essentials in prevention. To correct these defects and to obtain assistance for such families as need it, a special visit is necessary before a patient is discharged from the sanatorium.

The program, as outlined above, has certain advantages. It provides adequate nursing facilities in the community, which otherwise we could not supply, and it utilizes the community nurse for work which she can perform better than anyone else, as she is their family nurse, in whom, like the family physician, they have confidence, and who, because she has a generalized program, does not carry with her the stigma of tuberculosis. This extended service was started in September, 1933, and, although a year has not yet passed, it has more than doubled our nursing visits. Our clinic attendance has increased and it has stimulated a community interest in tuberculosis which was not noted previously.

Social Service Organization

This work in the Peninsula is carried on with the visiting and public health nurse as director. Tuberculosis has a strong appeal to most organizations and when families needing assistance are deserving, it has not been difficult to find voluntary organizations who are willing to care for their needs.

Publicity

Perhaps the publicity which is spread with our Christmas seals is our forte. We have, however, a large body of women who are interested in our program and whose activities are continually being published. Added to this, we have entertained our various councils at the sanatorium, and have used this opportunity to show them what can be done in the treatment and prevention of tuberculosis. Even this meagre education has already had a decided influence on their attitude towards the near-indigent. A yearly printed report for a small institution repays many times the cost of production.

Rehabilitation

This program has been difficult during the lifetime of our institution, since we came into being about the same time as the depression. Our greatest assistance in the field has been received from those plants in the district which employ industrial nurses or physicians. In practically every instance, these people have been able to take care of former employees by securing for them

suitable part-time sheltered employment. The arrangement is most satisfactory, since the patients are suitably supervised. However, about 80 per cent of our discharged cases do not come under this category, and to find employment for many of them at this time is an unsolved problem.

Bovine Tuberculosis

In our community the problem of bovine tuberculosis is not a serious one. Of 24,000 people living on farms, 50 per cent are supplied with milk from accredited herds. It is an item, however, which education and time alone will solve completely, unless legislation intervenes.

Extension of Program

To date we have confined our field of work mainly to known cases of tuberculosis and to contacts. In several instances this has led us into school rooms, where an open case has been discovered either in a pupil or in a teacher. In one instance a high school student admitted to the sanatorium had fibroid tuberculosis with cavity formation. Examination of 38 pupils in her class showed 23 reactors and in these we found one case with beginning cavitation and positive sputum, a second case with physical and x-ray signs of disease and a third case with a minimal lesion showing on x-ray. A fourth case in the room had tuberculous cervical glands. This work encouraged further study of high-school students. In a survey of 89 students, 3rd and 4th form high school ages, 14 to 19, we found only 13 pupils reacting to tuberculin. In this number, however, we found two minimal cases. Another survey of a group of 220 public-school children was made. In this group only 12 gave a positive reaction to the first doses of tuberculin.

As we extend our facilities for examinations, they will, first of all, include the high-school or adolescent group. Secondly, I feel that the examination of pre-school children has been a neglected field. In our experience, a pre-school child with a positive tuberculin test is usually living in a household with an open case and to locate chronic spreaders of disease by this indirect method would be a valuable piece of work. In my opinion, the high-school and pre-school groups should be examined before one considers routine examination of public-school children for tuberculosis.

Results

In summing up our accomplishments, it has been found possible, with adequate home nursing supervision, materially to reduce our patients' stay in hospital. This does not apply, of course, to those patients who, in spite of treatment, persistently have positive sputum.

The mortality rate in the counties of Welland and Lincoln for tuberculosis, all forms, was 120 per 100,000 in 1910, 78 in 1915, 50 in 1926, 41 in 1930 and 33 in 1933, a decease of 72 per cent. During this same period non-pulmonary tuberculosis decreased from 24 per 100,000 in 1910 to 15 in 1915, 6 in 1930 and 5 per 100,000 in 1933, a decrease of nearly 80 per cent.

We have attempted to apply a program of general health supervision to our contact group, paying special attention to the problem of tuberculosis.

Contributions to the Laboratory Diagnosis of Amoebiasis from the Chicago Outbreak of 1933*

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IN the year 1933 there occurred in Chicago an unprecedented outbreak of amoebiasis, the first of its kind ever recorded in a civilian population. The opportunities for evaluation of technical procedures and for confirmation of the previously accepted principles of diagnosis were exceptional.

The authors examined more than 4,000 specimens from the principal source of the outbreak and their experience has shown that certain points of differentiation are usually constant and dependable. It is the purpose of this article to review these essentials, bringing out the salient points of the diagnosis and emphasizing the laboratory procedures found to be most useful.

Methods

Arrangement of Quarters

In arranging quarters for the laboratories making surveys of food handlers and other groups, suites of rooms were selected, having several toilets in full view of an anteroom, where a record clerk was stationed. In this way there was reasonable assurance of securing bona fide specimens, where large groups were being handled. The specimens, after being identified by number and recorded, were passed on for immediate examination by the microscopists.

Macroscopic Examinaiion

Every specimen of stool should be examined in the gross for blood or mucous flakes. If these are present or if the specimen is diarrhoeal in character, more than the usual number of microscopic preparations should be examined for amoebae. Smears should be made especially from the mucous flakes and the portions having the appearance of blood.

Microscopic Examination

When the vegetative forms are expected, it is imperative that fresh material be examined, and even for examination of the cysts a fresh specimen is, as a rule, more satisfactory.

*From the Section of Technical Service and Research, Board of Health, Chicago, Illinois.
Read before the Society of American Bacteriologists, December 28, 1934, Chicago, Illinois.

The Water Preparation

To make the water preparation, a drop of distilled water or normal saline is placed on a clean slide, and a small portion of the faecal material is picked up on a wooden applicator and thoroughly mixed into the droplet. If the stool is liquid, or mucoid, no water need be added. A no. 1 cover slip is dropped over the mount and it is ready for microscopic examination.

The water preparation serves mainly for the detection of active vegetative forms, but also shows the presence of cysts.

The Iodine Stained Preparation

The iodine smear should always be employed whenever cysts are seen in the water mount. The stain consists of a 5 per cent solution of iodine in 10 per cent aqueous potassium iodide. A drop or two of the stain is placed on a clean slide, a small portion of the faecal material is added with a wooden applicator, and is thoroughly mixed. To assure good staining, the faecal material must be well stirred into the iodine droplet. A no. 1 cover slip is then placed over the preparation and the film is ready for examination.

The Cultural Method

Cultures were found to be very useful during the surveys in Chicago, as an adjunct to the direct examination. The medium used by us was that described by Cleveland and Sanders* which is prepared by dissolving 30 gm. of Difco Bacto-liver Infusion Agar, dehydrated, in 1,000 cc. of distilled water, and adding 0.3 per cent of crystalline disodium phosphate as a buffer. The final reaction is about pH 6.6. The medium is filled in tubes, sterilized by autoclaving for 20 minutes at 15 pounds' pressure and "slanted." The tubes are stored in a refrigerator until needed, and should preferably be used within about one week. Immediately before the inoculation, the tubes are covered with sterile serum water (1 to 6 of normal salt) to the level of the top of the slant. Horse, human, rabbit, or sheep serum may be used. A small amount of sterile rice flour, previously tested for its ability to support the growth of *E. histolytica*, is dusted into the tube at the time of inoculation. A portion of the faecal material about the size of a pea is inoculated into the medium with a sterile wooden applicator or needle and the tube is then placed in an incubator at 37° C. As a routine, the cultures are examined at the end of 24 and 48 hours. A small amount of the liquid from the bottom of the slant just above the sediment of rice flour is removed with a sterile capillary pipette, transferred to a glass slide, and covered with a no. 1 cover slip, for the microscopic examination.

The microscopic procedure for both direct smears and cultures is first to scan the preparation with a no. 10 ocular and 16 mm. objective. With this equipment, both the active protozoa and the protozoan cysts appear as tiny, bluish (or brown in the case of an iodine smear), highly refractile bodies. When one of these bodies is seen, it is immediately examined with a 4 mm. objective and then more closely, with an oil immersion lens.

Archiv für Protistenkunde*, **70: *224, 1930.*

The Permanent Stain

Two methods for making a permanent stain of the protozoa were employed. The longer procedure was the common iron haematoxylin method; a shorter and simpler method used with success was a phosphotungstic acid haematoxylin stain, which will be described later.

The Iron Haematoxylin Method

The iron haematoxylin method is quite valuable, both for study of the microscopic detail and to establish a permanent record for filing purposes. It is equally useful for both the cysts and the trophozoites. This method is as follows:

With an applicator, slide, or cover slip, make a thin smear on a no. 1 cover slip. Slides also may be used, and are found convenient when large numbers of stool specimens are examined.

Before the smear dries, it is dropped face downward in a warm (50°-60° C.) "Schaudinn's" solution for 10 to 15 minutes: two parts saturated solution of bichloride of mercury to one part of 95 per cent alcohol, to each 100 cc. of which mixture is added 5 cc. of glacial acetic acid.

Wash well with distilled water, to remove the bichloride of mercury, and place for a few minutes in 50 per cent alcohol.

Remove the remainder of the mercury salt by placing in a weak solution of 70 per cent alcoholic iodine for 15 minutes. Rinse in plain 70 per cent alcohol. The smears are now turned face upward.

Transfer to 85 per cent alcohol for 5 minutes, then to 95 per cent alcohol for one hour.

Hydrate by successive immersions for a few minutes in 85 per cent, 70 per cent, and 50 per cent alcohol, and then wash in distilled water.

Apply a mordant of 4 per cent aqueous iron-ammonia-alum solution for 1 to 12 hours.

Remove from the iron-ammonia-alum solution and wash in distilled water or tap water for about 10 minutes, or long enough to remove the excess of mordant. If there is the slightest precipitation when smears are transferred to the stain, it indicates that the washing was not continued long enough, but this does not materially impair the stain.

Stain the film in the iron haematoxylin solution from 6 to 12 hours.

Wash well in distilled water or tap water.

Differentiate, in a saturated aqueous solution of picric acid or a 2 per cent aqueous iron-ammonia-alum solution. If the solution tends to destain too rapidly, a more dilute solution should be used. (This decolorizing may also be done with a 95 per cent picric acid solution, after the smears have been run up through the alcohols to 95 per cent.)

When decolorizing directly from higher alcohols, there is always the difficulty of bringing back the desired blue shade, but this may be overcome by placing the smears for a few minutes in 95 per cent alcohol, to which has been added a small amount of potassium acetate. In this case, wash in 95 per cent alcohol and proceed to 100 per cent.

When the smears are destained sufficiently (until almost gray in appearance), place them in running tap water for 15 to 30 minutes.

Dehydrate by immersing successively for about 5 minutes for each solution, in 50, 70, 85 and 95 per cent absolute alcohol.

Clear by immersing for several minutes in two changes of xylol.

Mount by placing the cover glass face downward over a drop of Canada balsam on a slide.

The Phosphotungstic Acid Method (Mallory)

The phosphotungstic acid method is much shorter and, in our experience, was found to be quite satisfactory for practical use.

The stain is first made up in two solutions:

Solution A

Haematoxylin (white crystals, if obtainable) ..... 0.2 grammes
Distilled water ..... 160.0 ml.
Dissolved by boiling.

Solution B

Phosphotungstic acid ..... 10.0 grammes
Distilled water ..... 100.0 ml.
Dissolved by boiling.

After cooling, add 80 cc. of solution A to 20 cc. of solution B. Allow to mature in a covered unstoppered bottle (preferably in a sunny place) for one to five months. The ripening process may be dispensed with, if necessary.

Procedure

Prepare a thin smear as described under the iron haematoxylin method, and place the cover slip face downward in warm Schaudinn's solution for 10 to 15 minutes.

Rinse well in distilled water, and run up through 50 per cent, 70 per cent and 85 per cent alcohol, for 5 minutes each. Place in 95 per cent alcohol for about one hour.

Hydrate by successive immersion in 85 per cent, 70 per cent, and 50 per cent alcohol, for 5 minutes each.

Rinse in distilled water and place in the staining solution, preferably face downward, for 6 to 15 hours.

Wash in distilled water, and dehydrate by immersing for about five minutes successively in 50 per cent, 70 per cent, 85 per cent, and 95 per cent alcohol, and finally in absolute alcohol. Clear with xylol and mount in Canada balsam.

THE ESSENTIAL DIAGNOSTIC CHARACTERISTICS

The amoebae to be looked for in specimens from the human intestine are considered in the following order: *Endamoeba histolytica*, *Endamoeba coli*, *Endolimax nana*, *Iodamoeba bütschlii*, *Dientamoeba fragilis*, and *Endamoeba gingivalis*. All belong to the class Sarcodina, moving by means of pseudopodia.

E. HISTOLYTICA

The Trophozoite (Fig. 1)

Nucleus.—The nucleus of *E. histolytica* is perhaps the most dependable single diagnostic criterion at our disposal. It is very hard to see in the unstained specimen but by careful scrutiny with the oil immersion lens it can usually be found, and both the nucleus and the karyosome studied in detail.

The nucleus is enclosed by a rather delicate membrane, containing small, regular, bead-like masses of chromatin along the inner surface of the membrane. The karyosome (except when the nucleus is undergoing mitosis) is a small, compact mass of chromatin, *usually* centrally located. When the trophozoite is stained by iodine, iron haematoxylin or phosphotungstic acid-haematoxylin, the detail of the nuclear structure is quite distinct under the oil immersion lens.

Motility (Figs. 2 and 3).—The movement of the *E. histolytica* trophozoite as seen in the fresh faecal specimen is quite characteristic. Very active specimens have a rapid progressive movement, seemingly as if toward a definite destination. The pseudopodia are large, rounded and clear, and are

projected explosively. The entire contents of the trophozoite, including the nucleus, flows into or toward the pseudopodium (Fig. 3). In less active specimens, however, and in semi-formed stools, the projectile character of the movement is much less noticeable and may sometimes be lost entirely.

We have also observed another type of movement in actively motile specimens, similar to that described by Wenyon*—a "slug-like" or "gliding" motion, without noticeable change in shape. The moving amoeba seems to glide along, carrying with it a mass of cellular debris, attached to the posterior margin (Fig. 2). This latter type of motility was observed so frequently in the recent outbreak as almost to be considered "typical." It is sometimes very difficult or perhaps impossible to distinguish *E. histolytica* from *E. coli* trophozoites on the basis of motility alone.

Cytoplasm and Inclusions.—The cytoplasm of the trophozoite is composed of a clear ectoplasm and a refractile, delicate, finely granular endoplasm, which is very often conspicuously vacuolated (see Fig. 4). It also commonly has food vacuoles, which may contain erythrocytes, leucocytes, cellular fragments, and very occasionally yeast cells and bacteria. There seems to be some disagreement as to the diagnostic significance of the presence of erythrocytes within the amoeba, but we are able to state that in our own personal experience, comprising examination of several thousand specimens, we have never observed red blood cell inclusions in any trophozoites except those proving to be *E. histolytica*.

When the trophozoite has lost its typical motility, however, the problem of differentiation becomes much more difficult. Here the cell inclusions may be quite significant. If erythrocytes are present within the amoeba, a diagnosis of *E. histolytica* may in our judgment be definitely made (Fig. 1). Again, if a great deal of cellular or bacterial debris is seen in the fresh faecal specimen, one can be reasonably sure that the amoeba is not *E. histolytica*. Yet, in culture, *E. histolytica* trophozoites will commonly ingest starch cells, much cellular debris and many bacteria.

When the diagnosis of trophozoites is in doubt, we believe it advisable either to call for additional specimens or to inoculate cultures as quickly as possible. Very often, at the end of 24 to 48 hours at 37° C., *E. histolytica* can be recognized definitely, whereas *E. coli* trophozoites will usually be few in number and sluggishly active. If there is still doubt, however, successive transfers should be made from both 24-hour and 48-hour growths. *E. coli* does not survive several transfers, whereas *E. histolytica* will usually continue to grow and remain active in the transfers.

Size.—*E. histolytica* trophozoites, according to measurements taken by us, may vary in size from 15 to 50 microns. These measurements, it will be noted, have a wider range than that ordinarily given. The larger forms were observed mostly in specimens from severe clinical amoebic dysentery, but were also often seen in the cultures. In non-clinical cases, however, and also in most of the cultures, the amoebae were smaller in size.

*C. H. Wenyon, *Protozoology*, Vol. 1, pp. 194 and 196.

The Precysts.—The precystic forms differ from the trophozoites, principally in their smaller size and clear cytoplasm, which is always free from food vacuoles. Occasionally also, they may contain glycogen and chromatoid material. The nucleus of the precyst not infrequently contains large irregularly placed chromatin masses about the nuclear margin.

In our judgment it is not advisable for anyone to attempt diagnosis of this form of *E. histolytica* alone, because of the close similarity of the precysts of *E. histolytica* and *E. coli*. It is much wiser to search for definite cysts or trophozoites and, if these cannot be found, to resort to repeated examination of additional stools, and to sub-cultures.

The Cyst (Figs. 5, 6, 7 and 8)

Nuclei.—The nuclei of the *E. histolytica* cyst vary in number from one to four. Occasionally, but very rarely, there may be more.

The nuclei are seldom clearly seen in the water preparation made from faecal material. This is in distinct contrast to *E. coli* in which the nucleus is very commonly seen. In the iodine stained preparation, however, the nuclei of *E. histolytica* cysts stand out clearly. Morphologically they are similar in all respects to those of the trophozoites. There is a small, usually central, compact karyosome, which is also similar to that in the nucleus of the trophozoite.

Inclusions (Fig. 5).—The chromatoid bodies, which commonly appear in the younger cysts, are of great diagnostic significance. They appear as thick, opaque, rod-shaped masses, with blunt ends. Occasionally they may be sharply pointed, similar to those characteristic of *E. coli*. However, in general the chromatoid bodies of *E. histolytica* remain true to form. They are best studied in the haematoxylin stained preparations.

The young cysts of *E. histolytica* may also contain glycogen masses, differing from those of *Iodamoeba bütschlii* in their rather indistinct peripheral margin (Fig. 8).

Size and Shape.—*E. histolytica* cysts may vary from 8 microns in diameter in the smaller strains to 20 microns in the larger forms. They are usually spherical in shape but may sometimes be oval.

ENDAMOEBA COLI

The Trophozoite (Fig. 9)

Nucleus.—It is of diagnostic significance that the nuclear membrane of the *E. coli* trophozoite can usually be distinctly seen in the simple water preparation. This is in contrast to *E. histolytica*.

The nuclear membrane of the *E. coli* trophozoite is characterized by heavy, irregular masses of chromatin. The karyosome is larger than that of *E. histolytica*, and is much more prominent. However, the *position* of the karyosome in the nucleus, though typically eccentric, is of little diagnostic value in our experience, since it very often appears as *central*.

Motility.—The typical movement of *E. coli* is not as direct and progressive as that of the *E. histolytica* trophozoite. The pseudopodia of *E. coli* are less quickly formed, and they may be projected several at a time. There is less flowing of the protoplasm and cell contents into the pseudopodium and a tendency to rest lazily, without progressive movement.

Yet, in very fresh liquid stools and especially in young cultures, *E. coli* trophozoites may be very active and may sometimes assume a type of motility quite similar to that of *E. histolytica*. In fact, it may be altogether impossible to distinguish *E. coli* from *E. histolytica* trophozoites except by further subcultures, or examination of additional stools, especially those containing cysts.

Cytoplasm and Inclusions (Fig. 9).—The cytoplasm of the *E. coli* trophozoite is very coarsely granular, in contrast to the clear or finely granular cytoplasm of *E. histolytica*.

Copious inclusions are characteristic of the *E. coli* trophozoites. They consist of bacteria and cellular debris of nondescript character, but do not, in our experience, include red blood cells.

Size and Shape.—The size of the *E. coli* trophozoites is a factor of little importance in the differentiation, since the range of normal variation between *E. histolytica* and *E. coli* trophozoites overlaps. The *E. coli* trophozoites are, as a rule, slightly larger than those of *E. histolytica*, yet the latter, especially in severe cases of amoebic dysentery, are frequently the larger.

The Precyst

E. coli precysts are very similar to those of *E. histolytica*, except for a tendency to be slightly larger. (See *Precysts*, under *E. histolytica*.)

The Cyst (Fig. 10)

Nuclei.—The number of nuclei of *E. coli* cysts ranges from one to eight. Frequently as many as twelve are seen. The morphology of the nucleus in the cysts is similar in all respects to that of the trophozoite. The "typically eccentric" karyosome was often observed in our experience, but seems to be of little diagnostic significance, since it more often appears to be central in the nucleus.

Inclusions.—The younger *E. coli* cysts frequently contain chromatoid bodies, but much less often than the cysts of *E. histolytica*.

The typical chromatoid bodies of *E. coli* are thinner and more splinter-like and have more sharply pointed ends than those of *E. histolytica*.

A large glycogen body is often seen in young *E. coli* cysts.

Size and Shape.—The cysts of *E. coli* are much larger, as a rule, than those of *E. histolytica*. They vary greatly in size, ranging from 15 to 30 microns in diameter. They are ordinarily round, but occasionally ovoid in shape.

ENDOLIMAX NANA

The Trophozoite (Fig. 11)

Nucleus.—The nucleus of *E. nana* is quite inconspicuous in both the water and iodine preparations. There is an indistinct nuclear membrane apparently free from chromatin, and the karyosome is large and irregularly shaped, occupying most of the nucleus.

Motility.—The *E. nana* trophozoite has a slower movement than that of *E. histolytica*. The pseudopodia are well defined, smooth protrusions, which may be blunt or telescopic in shape. They are less rapidly or "explosively" formed than those of *E. histolytica*. There is also little flowing of protoplasm toward the pseudopodium. However, when the amoeba is in a very active state, the movement may resemble that of the *E. histolytica* trophozoite.

Cytoplasm and Inclusions.—The cytoplasm is often vacuolated and usually contains many bacteria and much cellular debris.

Size.—The trophozoite of *E. nana* ranges in size from 6 to 12 microns, the average being approximately 9 microns. In culture the trophozoite, when in active movement, may occasionally attain a length of 12 microns or more.

The Cyst (Figs. 12 and 13)

Nuclei.—The cyst of *E. nana* contains one to four nuclei, which are not easily seen in the water mount and are also ill defined in the iodine preparation. When stained with haematoxylin, however, the nuclei and karyosome are clearly seen. The karyosome is a large irregularly shaped mass of chromatin, occupying most of the nucleus.

Size and Shape.—The length of the cyst ranges from 6 to 10 microns and the width averages about 5 microns. It varies considerably in shape, sometimes being ovoid, sometimes spherical, and sometimes elongated.

IODAMOEBA BÜTSCHLII

The Trophozoite

The trophozoite of *I. bütschlii* is seldom observed in the direct smear from the faecal specimen, but is rather frequently seen in the cultures.

Nucleus.—The nucleus of *I. bütschlii* cannot usually be seen in the water preparation, except with the oil immersion objective. The karyosome is a highly refractile body, lying in the clear substance of the ill defined nucleus. In the iodine or haematoxylin stained preparation, however, the nucleus is well defined (difference from *E. nana*) and the karyosome is a large, spherical, compact body in the centre.

Motility.—The movement of Iodamoeba trophozoites in fresh faecal

material is very sluggish, but in culture is often rather active. The pseudopodia are blunt and rounded, and are usually projected two or more at a time. Sometimes, however, narrower protrusions are formed with jagged margins.

Size.—The trophozoite of *I. bütschlii* is intermediate in size between *E. coli* and *E. nana*, usually measuring between 9 and 15 microns.

The Cyst (Fig. 14)

Nucleus.—The cyst of *I. bütschlii* contains a single nucleus, which usually lies close to one side. The karyosome differs from that of the trophozoite in that it is not compact and that it also lies close to the nuclear margin.

Inclusions (Fig. 14).—The cysts of *I. bütschlii* are characterized by one or more glycogen masses, visible in the water preparation as highly refractile bodies, which stain a dark brown colour with iodine. In the haematoxylin stained specimen, however, the glycogen body appears as a large, clear vacuole, wholly unstained.

Size and Shape.—The size of the *I. bütschlii* cyst is from 7 to 13 microns in diameter, and the shape is round or ovoid.

DIENTAMOEBA FRAGILIS

D. fragilis was observed rather frequently during the outbreak of 1933. Although difficult to find in fresh faecal material, it grows very well in the cultures.

The Trophozoite (Fig. 15)

Nuclei.—D. fragilis receives its name from the characteristic two nuclei present in the trophozoite. However, forms of this parasite are constantly seen with but one nucleus. It is difficult to find the nuclei in the water preparation or iodine stained preparation, but with the haematoxylin stain they are quite well defined. Around the nuclear membrane there is often a fine rim of chromatin granules arranged rather regularly. The karyosome is commonly large and compact. Sometimes, however, it may be slightly dispersed.

Motility.—The pseudopodia of *D. fragilis* are ectoplasmic; they start characteristically at one point and ruffle out on either side to give a broad fan-like effect, the margin of which is coarsely serrated, like the edge of a bread knife. The endoplasm has a tendency to move in the direction of the pseudopodia, but lacks the flowing quality characteristic of the *E. histolytica* trophozoite. Progressive movement is sometimes observed, but is very slow. The amoeba often forms several pseudopodia at once from various points about the periphery. After the typical movement of the trophozoite has once been noted, *D. fragilis* cannot be confused with any of the other intestinal amoebae of man.

Cytoplasm and Inclusions (Fig. 15).—The cytoplasm is delicate and often contains many bacteria and much debris. It is so transparent that the light must be cut down before the amoeba can be clearly seen with the microscope.

Size.—D. fragilis has a rather wide range of size, varying from about 5 to 20 microns (sometimes larger).

The Cysts

No encysted form has as yet been generally recognized.

ENDAMOEBA GINGIVALIS

E. gingivalis is primarily an organism of the mouth. It is said to be found occasionally in faeces, however, and is therefore considered here.*

The Trophozoite

Nucleus.—The nucleus of *E. gingivalis* resembles that of *E. histolytica* in that it is single and has a small compact karyosome, which may be either centrally or eccentrically placed in the nucleus.

Motility.—The motility of the trophozoite is sluggish. The pseudopodia are blunt in outline and are thrust out several at a time. They are formed initially from the clear ectoplasm, into which the granular, grayish endoplasm then slowly flows.

Cytoplasm and Inclusions.—The ectoplasm is clear and transparent, but is not readily distinguishable except when the amoeba is in motion. The endoplasm is granular and of grayish cast and has many food vacuoles, which contain nuclei of degenerated pus cells and tissue cells, miscellaneous debris and bacteria of various kinds.

Size.—E. gingivalis ranges in size from 10 to 40 microns, but is rarely more than 20 microns in diameter.

The Cyst

Several observers have reported finding cysts of *E. gingivalis*, but as yet no definite proof of their existence has been offered.

OTHER PARASITIC FORMS

THE FLAGELLATES

In addition to the five common intestinal amoebae, certain other protozoa belonging to the class *Mastigophora*, namely, *Trichomonas intestinalis*, *Giardia intestinalis*, and *Chilomastix mesnili*, are often encountered in the examination of faecal specimens.

**Note: In our experience, we have never been able to recognize* E. gingivalis *in faeces.*

TRICHOMONAS INTESTINALIS

The Trophozoite

T. intestinalis is a rather common intestinal protozoon in liquid or semi-solid stools. It grows readily in culture.

Nucleus.—It has a single nucleus.

Motility.—The organism moves by means of four flagella and an undulating membrane. When active, it cannot possibly be confused with an amoeba, because of its characteristic rapid, jerky, spiral movement. But it may lose its flagella and become quiescent, and in this state may throw out long, finger-like pseudopodia, resembling to a certain extent those of an amoeba. This type of movement, however, will not be confusing to the experienced observer.

Size and Shape.—The size is from 5 to 15 microns in length. The organism is pear-shaped.

The Cyst

No encysted form has as yet been described.

GIARDIA INTESTINALIS (Lamblia)

The Trophozoite (Fig. 16)

G. intestinalis is probably the most common of the intestinal flagellates. The trophozoites are most often found in liquid stools, whereas in semi-formed or solid stools the encysted form is more apt to be present. Both the trophozoites and cysts are so characteristic in appearance that, once seen, they are thereafter easily identified.

Nuclei.—There are two nuclei in the trophozoite, one on either side of the axostyle, or central dividing line.

Motility.—When in motion, the cell vibrates perceptibly, being propelled by four pairs of rapidly moving flagella.

Size and Shape.—The trophozoites vary considerably in size, measuring from 10 to 21 microns in length, and are pear-shaped.

The Cyst

Nuclei.—The matured cysts of *G. intestinalis* have four nuclei. The detailed structure can be seen in preparations stained with iron haematoxylin or by Mallory's phosphotungstic acid method.

Size and Shape.—In the water preparation, the cysts of *G. intestinalis* appear as elongated or ovoid bodies, varying in length from 8 to 17 microns.

The organism does not grow in the liver infusion agar medium used by us.

CHILOMASTIX MESNILI

The Trophozoite (Fig. 17)

Trophozoites of *C. mesnili* are occasionally present in liquid or semi-liquid stools and are rather frequently found in the cultures. Superficially they may resemble the active forms of either *G. intestinalis* or *T. intestinalis*. The

differential points are the character of movement and the presence of a long, spiral cytostomal groove, which extends longitudinally for about half the length of the organism.

Nucleus.—The organism has a single nucleus.

Motility.—The trophozoite has a smooth, spiral motion and moves with the larger end forward. The flagella can be seen trailing backward from their point of attachment, and it is their rhythmic lashing which propels the organism.

Size and Shape.—The trophozoite varies from 10 to 20 microns in length and it is shaped very much like a carrot.

The Cyst

Nucleus.—In the water mount, no cellular detail can be observed, but in the iodine preparation the single nucleus can be seen, usually lying near the narrower end of the cyst. In the permanently stained films the nucleus and the detailed structure are clearly defined.

Size and Shape.—The small lemon-shaped cysts measure from 7 to 10 microns in length. One end is often abruptly narrowed.

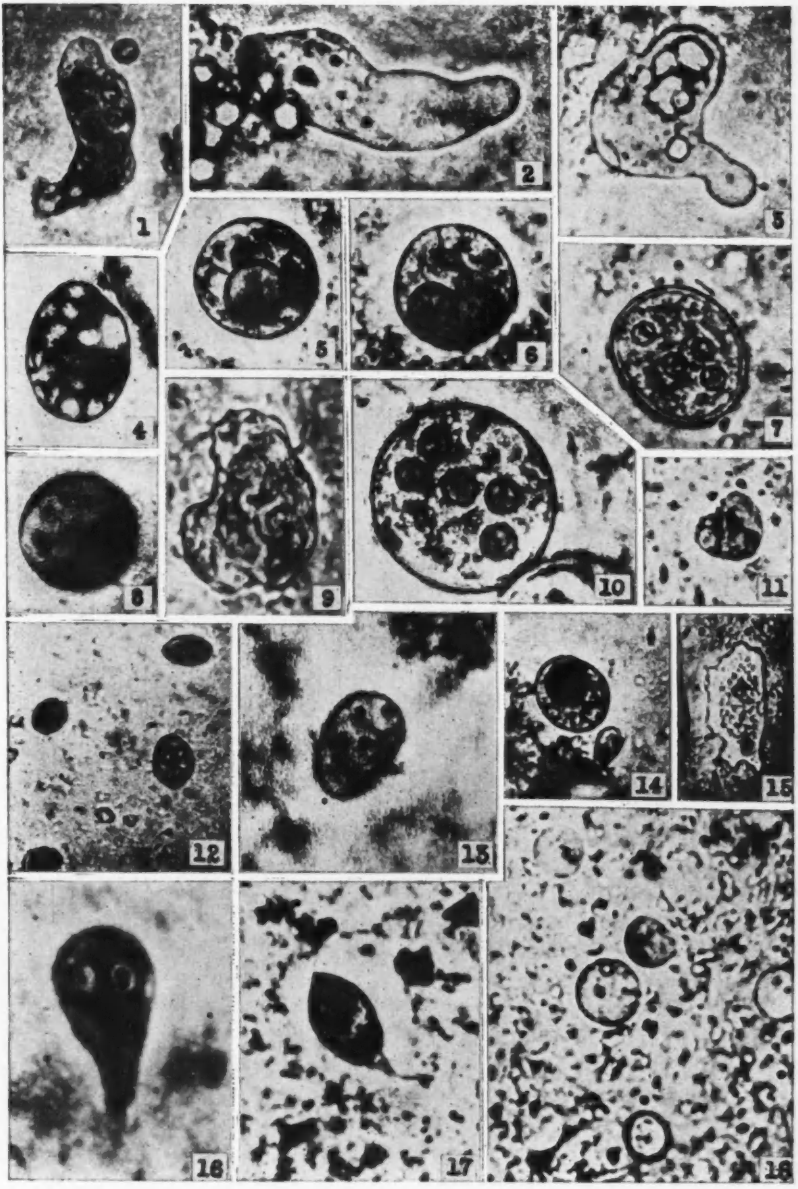
BLASTOCYSTIS HOMINIS (Fig. 18)

Blastocystis hominis is a yeast-like mould which may easily be confused with *E. histolytica* by the beginner searching for intestinal protozoa. The cells vary greatly in size and shape, but are usually round and are not as refractile as the protozoan cysts. They have a characteristic large central vacuole, with a narrow refractile rim, and contain one or more nuclei.

The organism multiplies so rapidly in culture that it tends to outgrow all other forms in forty-eight hours of incubation.

KEY TO FIGURES

FIGURE 1.—*Endamoeba histolytica* trophozoite, from faeces, containing erythrocytes.
FIGURE 2.—*Endamoeba histolytica* trophozoite, from culture, containing rice starch.
FIGURE 3.—*Endamoeba histolytica* trophozoite, showing pseudopodium.
FIGURE 4.—*Endamoeba histolytica* trophozoite, stained with iron haematoxylin, showing single nucleus and many vacuoles.
FIGURE 5.—Young *Endamoeba histolytica* cyst, with single nucleus and chromatoid body.
FIGURE 6.—Young *Endamoeba histolytica* cyst, with two nuclei.
FIGURE 7.—Mature *Endamoeba histolytica* cyst, with four nuclei.
FIGURE 8.—*Endamoeba histolytica* cyst, stained with iron haematoxylin, showing single nucleus and unstained glycogen body.
FIGURE 9.—*Endamoeba coli* trophozoite.
FIGURE 10.—*Endamoeba coli* cyst, having eight nuclei, showing five nuclei within one plane.
FIGURE 11.—*Endolimax nana* trophozoite.
FIGURE 12.—*Endolimax nana* cysts.
FIGURE 13.—*Endolimax nana* cyst, greatly enlarged.
FIGURE 14.—*Iodamoeba bütschlii* cyst, stained with iodine, showing glycogen body.
FIGURE 15.—*Dientamoeba fragilis* trophozoite.
FIGURE 16.—*Giardia intestinalis* (Lamblia), stained with iron haematoxylin, greatly enlarged.
FIGURE 17.—*Chilomastix mesnili* trophozoite.
FIGURE 18.—*Blastocystis hominis.*



FIGURES 1-18.

COPROZOIC, OR FREE LIVING AMOEBAE

Coprozoic amoebae are sometimes encountered in stools, especially when the specimen has been kept moist and warm for some time. The trophozoites may be confused with those of *E. histolytica* in the microscopic examination, but are definitely differentiated by the presence of a contractile vacuole.

The cysts may have from one to four nuclei.

Coprozoic amoebae grow readily in almost any of the ordinary bacterial culture media, both liquid and solid. This is a valuable differential characteristic.

REVIEW OF ESSENTIAL POINTS

In order to make a trustworthy diagnosis of amoebiasis, the technician must identify every type of protozoon found, whether active or encysted. The presence of a harmless species of parasite does not in any way preclude the possible presence of *E. histolytica*.

When a large trophozoite is found, it is likely to be either *E. coli* or *E. histolytica*. If it contains erythrocytes, a diagnosis of *E. histolytica* may be safely made. A careful study of the nuclei, the cell inclusions, and the character of movement is essential for the differentiation.

Cultures are of value as a supplement to the direct examination, but we believe that the diagnosis should not be made from the culture alone, as a routine procedure.

The smaller amoebae, especially in vegetative form, should also be carefully identified, since small varieties of *E. histolytica* are sometimes encountered.

When precysts or any non-motile vegetative forms are seen, every effort should be made to find either the active or the encysted forms. If these cannot be found, additional specimens of stool should be called for.

In differentiating the protozoan cysts, chromatoid bodies are of especial value. They are to be looked for in the water or haematoxylin stained preparations.

The presence of *glycogen bodies* in the cysts is not *necessarily* distinctive of *I. bütschlii*, since very young cysts of almost *any* amoeba may sometimes contain glycogen. A distinctive point, however, is that in the cysts of Iodamoeba the peripheral margin of the glycogen body is very sharply defined.

In the examination of faecal material for amoebae, a negative report must NEVER be given if the person examined has taken bismuth, arsenic, quinine, iodides, or other amoebicidal drugs within a week before collection of the faecal specimen.

It should also be remembered that proficiency in the microscopic differentiation of the amoebae can be acquired only by long experience in the microscopic examination of very many specimens. Such experience on the part of the laboratory technician should be rigidly required of all those entrusted with the responsibility of independent diagnosis.

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CERTIFICATION OF SANITARY INSPECTORS

THE announcement in this issue of the JOURNAL of the conduct of the first examinations for the certification of sanitary inspectors by the Canadian Public Health Association is an occasion for much satisfaction. This important action is the result of the enthusiasm and perseverance of that group of trained sanitary inspectors who for twenty-two years have maintained an association to foster the highest ideals among those engaged in this important phase of public health effort, and of those others in the field of public health who, as members of the several committees of the Canadian Public Health Association, have laboured to improve the status of the sanitary inspector. The development of the plan which will shortly be in actual trial is due also in large measure to the interest and co-operation of the federal and the provincial departments of health.

There is no thought that certification is an obligatory requirement. The Association desires to encourage those who as the result of individual and group effort have sought and attained adequate training and to indicate its approval of such effort by this expression of merit. It is, of course, recognized that certification is only a step in the achievement of the objective of both the Canadian Institute of Sanitary Inspectors and the Canadian Public Health Association. Of essential importance is the training which inspectors should receive. The committee charged with the responsibility of developing the plans, in presenting its report at this year's annual meeting, emphasized the necessity of adequate training but indicated that for the present the publication of a syllabus of studies as a guide to the candidate is all that is possible. A formal course of instruction for prospective sanitary inspectors is being offered by the University of Montreal through its School of Social Hygiene. Apart from this provision, no other college courses are available. That a similar situation exists in the United States is evidenced by the fact that, although numerous attempts have been made to provide training courses, only in New Jersey, Tennessee, and Los Angeles County are such courses offered. In the School of Government, University of Southern California, consideration is being given to the establishment of courses leading to a certificate in public health sanitation. In Great Britain lectures and demonstrations are arranged in many centres through the co-

operation of the Royal Sanitary Institute and the Sanitary Inspectors' Association. It is further encouraging to learn that, after careful consideration, a recommendation was made to the American Public Health Association at its annual meeting last year that a board for the certification of sanitary inspectors should be established, with a full-time executive secretary, to hold examinations and to issue certificates in the name of the Association.

The present satisfactory position of the sanitary inspector in Great Britain is due in no small measure to the steps taken by the Royal Sanitary Institute years ago in establishing standards of training and in granting certificates to properly qualified inspectors. In Canada the Royal Sanitary Institute has for years conducted examinations in several of the provinces and has extended to those successful candidates qualifying the same privileges that are enjoyed by those obtaining their training and resulting certification in Great Britain. The value of this splendid co-operation is evidenced by the present steps which have been taken at the desire of the Canadian Institute of Sanitary Inspectors to emulate the progress made in Great Britain. In undertaking to assume certain definite responsibilities for sanitary inspectors in Canada, the Canadian Public Health Association joins with the Royal Sanitary Institute in a common purpose; namely, improving the training and the status of sanitary inspectors.

The steps taken by the Canadian Public Health Association would seem to be a step toward reaching the objectives mentioned above, and in so moving forward we thus enable the inspector to give better service and to become a more efficient member of the health organization of which he is a part.

RETIREMENT OF SIR GEORGE NEWMAN, K.C.B.

PUBLIC health administrators throughout the world have learned to look with eager expectancy for the annual reports of Sir George Newman, K.C.B., as Chief Medical Officer of both the Ministry of Health and the Board of Education. His annual reports have given to the world a comprehensive critical review of the real problems in preventive medicine as affecting Great Britain and at the same time have served to indicate the need for action and the methods by which results can be obtained in every country with comparable problems. The announcement of his retirement from active responsibilities has been received with mingled feelings of pleasure and regret; of pleasure in the knowledge that Sir George will be free from administrative duties to enjoy to the full his many personal interests, and regret that we shall not have the guidance and stimulus of his valued reports. Now that he will have some measure of leisure, it is not too much to hope that the rich results of his years of experience and of his far-seeing vision will, from time to time, be made available in new volumes of reference for medical officers of health and others concerned in public health administration.

To Sir George the officers of the Canadian Public Health Association extend their good wishes for many years of enjoyable leisure and to Dr. Arthur Salusbury MacNalty, his successor, their hearty congratulations.

REPORTS

from the

Twenty-fourth Annual Meeting

Held in Toronto June 3, 4 and 5, 1935

Part II

SECOND REPORT OF THE COMMITTEE ON THE CERTIFICATION OF SANITARY INSPECTORS

FOLLOWING the acceptance of the report of this committee as presented at the annual meeting in Montreal in June, 1934, the Executive Committee approved of the appointment of a national committee and empowered it to carry out the necessary steps in the certification of sanitary inspectors as proposed in the report. The committee appointed consists of Dr. J. G. Cunningham, Ontario Department of Health, Toronto, chairman; Dr. J. A. Baudouin, University of Montreal; Dr. P. S. Campbell, Chief Health Officer, Provincial Department of Health, Halifax; Dr. R. D. Defries, School of Hygiene, University of Toronto; Dr. A. J. Douglas, Medical Officer of Health, Winnipeg; Dr. D. T. Fraser, School of Hygiene, University of Toronto; Dr. R. B. Jenkins, Medical Officer of Health, Edmonton; Dr. B. C. Keeping, Chief Health Officer, Charlottetown, P.E.I.; Mr. T. J. Lafrenière, Provincial Bureau of Health, Montreal; Mr. Douglas Little, City Health Department, Winnipeg; Dr. R. St. J. Macdonald, Department of Public Health and Preventive Medicine, McGill University, Montreal; Dr. J. W. McIntosh, Medical Officer of Health, Vancouver; Dr. C. W. MacMillan, Provincial Department of Health, Saint John; Mr. R. H. Murray, Department of Public Health, Regina; Mr. A. S. O'Hara, Provincial Sanitary Inspector, Sioux Lookout, Ontario, and vice-president of the Canadian Institute of Sanitary Inspectors; and Dr. J. T. Phair, Ontario Department of Health, Toronto, secretary.

It was found desirable to appoint a sub-committee to prepare for the national committee a syllabus and to offer recommendations concerning preliminary education, registration, and the conducting of examinations. This sub-committee is composed of Dr. J. G. Cunningham, chairman; Dr. J. A. Baudouin, Dr. R. D. Defries, Dr. D. T. Fraser, Dr. R. St. J. Macdonald, Mr. A. S. O'Hara, and Dr. J. T. Phair, secretary. The members of the sub-committee undertook to prepare recommendations regarding the content of the syllabus during the summer and met in Toronto on November 15th and 16th. Careful consideration was given to the subjects of preliminary education, registration and syllabus. The report of the sub-committee on these matters, together with a plan for the conduct of examinations, was submitted to the remaining members of the national committee in March, 1935. According to these recommendations, the sub-committee will be designated the "Central Board of Registration and Examination."

Although it was felt that those not already engaged in service should be

required to show evidence of having received an acceptable type of secondary school education, it was the belief of the committee that to demand such a standard immediately might defeat the purposes of the committee and it was recommended that such requirement be demanded as from January 1, 1938; in the meantime, that a good educational background be accepted and that the eligibility of such candidates be passed on by the Central Board of Registration and Examination; and that this committee not be hampered by any unelastic restriction at present.

As the details of registration as affecting those who are already employed as sanitary inspectors are outlined in the ANNOUNCEMENT and as the whole plan of the committee is presented therein, no further reference is necessary. The committee desires to recommend that the first examinations be conducted during November or December and that due publicity be given to this announcement. The committee is proceeding with the appointment of provincial examining boards.

J. T. PHAIR, *Secretary.* J. G. CUNNINGHAM, *Chairman.*

APPENDIX

ANNOUNCEMENT OF THE CANADIAN PUBLIC HEALTH ASSOCIATION

CERTIFICATION OF SANITARY INSPECTORS

HISTORICAL STATEMENT

FOR a number of years the provincial medical officers, the Canadian Public Health Association and the Canadian Institute of Sanitary Inspectors have given careful consideration to the status of sanitary inspectors in Canada. At the annual meeting of the Canadian Public Health Association held in Saint John, N.B., in June, 1933, a committee of the Association appointed to report on the qualifications and training of sanitary inspectors presented their recommendations in the following resolution:

> "That the Canadian Public Health Association establish a committee to be known as the Committee for the Certification of Sanitary Inspectors; that this Committee have representatives of the Sanitary Inspectors' Association; that it be empowered to establish educational standards and to appoint boards of examiners who shall conduct examinations and shall recommend to the Canadian Public Health Association as being eligible for certification those candidates who have successfully completed such examination."

Following the endorsation of this resolution by the Association, the plan was subsequently approved by the Department of Pensions and National Health, the provincial health authorities and the Canadian Institute of Sanitary Inspectors. Accordingly, the Canadian Public Health Association has proceeded to establish educational standards, to appoint boards of

examiners and to arrange for the certification of successful candidates. A national committee charged with this responsibility has been appointed through the co-operation of the Department of Pensions and National Health, the Provincial Departments of Health and the Canadian Institute of Sanitary Inspectors. This committee has constituted a sub-committee, to be known as the Central Board of Registration and Examination, for the conduct of registration, the holding of examinations, and such other business as the National Committee may refer to it. The chairman of this Board is Dr. J. Grant Cunningham, who is also chairman of the National Committee, and the secretary is Dr. J. T. Phair. Examinations will be conducted in various centres under the direction of Provincial Examining Boards. The Provincial Examining Boards will consist of at least three members, including the chairman, who will be the provincial representative on the National Committee. The membership of the Board shall include, as far as possible, a sanitary inspector, a medical officer of health, and a sanitary engineer. The chairman will make nominations for the membership of the Board, submitting these to the National Committee for approval.

At the annual meeting of the Association held in Toronto in June, 1935, the committee presented the plans of the Central Board for the holding of the first examinations during the fall of this year. Approval was given to the recommendations of the committee, including the registration requirements as relating to members of organized departments of health who are already engaged in sanitary duties and to those not so engaged who desire to become inspectors. Approval was given also to the syllabus of studies which is intended to serve as a guide for the candidate in his study.

REGULATIONS

REGISTRATION

1. Application for examination shall be made on the forms supplied by the Central Board of Registration and Examination.

2. (a) Prior to January 1, 1938, candidates who are members of an organized department of health and have been employed in sanitary duties for at least one year may be considered eligible for examination.

(b) All candidates seeking certification in keeping with sub-section (a) of section 2 shall make application on or before December 31, 1937.

(c) Such candidates shall make application to the Secretary not later than thirty days before the date of any examination held prior to December 31, 1937.

3. Applicants whose eligibility for examination has not been established prior to December 31, 1937, shall as a basic requirement have completed an acceptable type of secondary school education.

4. Candidates who do not qualify for examination under section 2 (a) shall make application to the Secretary at least six months prior to the holding of an examination, at which time they shall submit to the Secretary such

evidence of their eligibility as the Committee on the Certification of Sanitary Inspectors may designate. Such candidates, before being admitted to the examination, shall present evidence of having completed an approved course of practical training in a department of health acceptable to the Board. A certificate from the administrative officer of the health department in which the training has been received shall be required.

5. It shall be understood that these regulations are subject to amendment by action of the Canadian Public Health Association at any annual meeting of the said Association on the recommendation of the National Committee.

EXAMINATIONS

The examination shall be written, oral and practical. It shall be conducted at least annually. The Central Board of Registration and Examination shall be responsible for the preparation of the written papers and shall arrange with the chairman of the Provincial Examining Board of the provinces in which examinations are to be held for the conduct of the written, oral and practical examinations. The written examinations shall be held at the same time in the various provincial centres. The oral and practical examinations shall be held at the time of the written examination.

FEES

The fee for the examination shall be fifteen dollars, of which amount one-third shall be forwarded with the application and the balance shall be paid not later than thirty days before the date of the examination. If the application be not accepted, the fee deposited will be returned.

CERTIFICATE

Candidates who have completed the requirements as established by the Committee with the approval of the Canadian Institute of Sanitary Inspectors, shall be granted a certificate by the Canadian Public Health Association (C.S.I. (C.)). This certificate is a certificate of competency and is intended to meet the requirements of provinces and municipalities for a qualified sanitary inspector.

SYLLABUS

The following syllabus of studies is intended as a guide for the candidate in his training. The content of knowledge as presented by the various headings is to be interpreted in the light of the sanitary inspector's requirements and responsibilities. It is essential that the candidate obtain a sound practical knowledge by attendance with a qualified inspector under the direction of the medical officer of health of a municipality of sufficient size and with a well organized department of health, to permit of the candidate receiving training in all the ordinary duties of the sanitary inspector. The provision of lectures and demonstrations as arranged in certain municipalities is of great assistance

to the candidate. A formal course of instruction is being offered by the School of Social Hygiene, University of Montreal. Arrangements for tutorial instruction may be made with qualified inspectors in various municipalities. The secretary of the Central Board will be pleased to supply a list of suitable textbooks and of government and other publications.

SYLLABUS FOR SANITARY INSPECTORS

Communicable Diseases

Meaning of the terms: micro-organism, communicable disease, contact, carrier, quarantine and isolation, concurrent and terminal disinfection.

Immunity: General conception of. Types of immunity. How immunity may be acquired. Meaning of terms: serum, vaccine, prophylaxis, active immunity and passive immunity.

General knowledge of the specific preventive agents, vaccines and sera.

Knowledge of the causative agent and its habits; the source of the infection in the community; mode of spread; period of greatest communicability; incubation period; the more important complications having relation to quarantine regulation; the periods of isolation and quarantine in the following diseases, and methods of prevention and control:

Epidemic meningitis.
Chicken-pox.
Diphtheria.
German measles.
Mumps.
Paratyphoid fever.
Poliomyelitis.
Rabies.
Scarlet fever.
Smallpox.
Trachoma.
Tuberculosis.
Typhoid fever.
Undulant fever.
Whooping cough.

In addition, such other diseases as may be named in the regulations of the candidate's province.

Fumigation and disinfestation: Methods, efficiency. Dangers and limitations.

Insects and health: Flies, mosquitoes, bedbugs, cockroaches. Habits and methods of control.

Legislation for the control of communicable diseases, with particular reference to the candidate's province:

(1) Provisions of the Public Health Act.
(2) Regulations made under the authority of the Public Health Act, including notification, quarantine, isolation and disinfection as relating to the diseases named therein.
(3) Regulations in respect to the burial and transportation of the dead.
(4) Regulations in respect to fumigation.

Vital Statistics: Definition. Value in public health. Meaning of the terms: morbidity rate, mortality rate, case fatality rate, infant mortality rate, and maternal mortality rate. Making tables for use in reports. Essential features in construction and use of tables in making reports.

Water

Types of water. Physical characteristics of good drinking water.

Sources of supply, surface and underground; pollution of.

Requirements of cities and towns (per caput). General features of supply works, treatment works, and distributing systems.

Methods of water purification (physical and chemical) and their general features; domestic and municipal filtration (various types), storage, chlorination, softening and other purifying processes on large and small scale.

Sources of contamination and protective precautions (ways in which water may be polluted during collection, storage and distribution and the means of preventing such).

Pollution of rivers and lakes.

Private water supplies: Types, sanitary importance of.

Wells: Types, pollution of, protection of.

Watershed: Definition, survey of, report on condition of, protection of.

Significance of chemical and bacteriological examinations of water samples and their limitation.

Means by which water (contaminated) may be rendered safe for use.

Water in relation to public health. Diseases spread by water.

Ice in relation to disease. Control of ice supplies.

Legislation as pertaining to water and water supplies.

Sewage and Sewerage Systems

Definition of sewage, sludge and sewerage.

Essential parts of a municipal sewerage system.

Principles of the various methods of municipal sewage treatment and disposal, dilution, Imhoff tank, trickling filter, broad irrigation, and activated sludge.

Domestic sewage disposal: Types, specifications for construction, and location of sanitary privies; chemical toilet; design, construction and location of cesspools and septic tanks; significance of grease traps.

Plumbing and Drainage

Construction and design of drains; inspection and testing; sanitary fittings; general knowledge of the regulations relating to soil stack, waste and vent pipes, traps, venting, joints, water pipe connections, and material specifications as in force in the candidate's municipality or province.

Refuse

Composition, methods of collection and principal means of disposal.

Milk

Composition of milk. Laboratory tests to determine quality of milk. Important field tests.

Meaning of "certified" milk, "pasteurized" milk.

Conditions essential for the production, storage and distribution of clean, safe milk.

Dairy farm inspection. Design, construction and sanitation of cow-sheds. The healthy cow, care of. Testing for tuberculosis and contagious abortion. The milker in relation to contamination. Legislation dealing with communicable diseases. Milk-house, design and essential requirements. Care of dairy farm utensils. Transportation methods.

Dairy supervision. Dairy plant sanitation. Personnel. Equipment in milk processing. Essentials of the pasteurization process. Defects and their correction. Sampling and scoring.

Diseases which may be transmitted by milk.

Legislation, Federal, provincial and municipal, concerned with milk supply; milk and cream standards.

Food and Food Control

Food in relation to health.

Characteristics of good and bad food. Simple methods of recognizing spoiled foods.

Sanitation of food shops. Health of food handlers.

Practical methods and essential factors in inspection of food and food shops, as restaurants, bake-shops, grocery, fruit and fish shops, etc.

Methods of preservation and storage of foods.

Food adulteration.

Meat inspection. Procedure. Important diseases and conditions in animals which render a carcass unfit for food. Meat as a factor in the spread of disease.

Fish inspection.

Sampling of foods.

Legislation: Federal, provincial and municipal Acts, by-laws and regulations governing food products and food handlers.

Ventilation and Heating

Composition of air. Changes in room air.

Effects of inadequate ventilation on health. Effects of high temperatures (heat exhaustion and heat stroke).

Essential factors in ventilation. Purpose of ventilation. Air space requirements.

Simple methods of ventilation of rooms, schools and other public buildings.

Determination of efficiency of ventilation. Kata thermometer.

Method of investigating condition of atmosphere.

Principles of calculating areas. Cubic space, wall space, floor space requirements.

Size and position of windows. Air change requirements.

Overcrowding and its effects.

Methods of heating. Advantages and disadvantages.

Lighting

Standards of illumination. Adequacy of daylight. Location and size of windows.

Essentials of good lighting.

Glare and its prevention.

Artificial lighting; advantages and disadvantages; types of lighting units.

Instruments for measuring intensity and adequacy of illumination.

Sunlight and illumination. Value of sunlight.

Housing

General knowledge of materials used in construction and general principles of construction.

Inspection, procedure and authority for.

Interpretation of maps, plans and section drawings.

Knowledge of what constitutes a sanitary dwelling.

Overcrowding—regulations relating thereto.

Nuisances

Definition and types of. Procedure for investigation and abatement. Provincial and municipal legislation in the candidate's province.

Public Health Organization, Administration and Legislation

Dominion: Department of Pensions and National Health.

General knowledge of the organization of the Department of Pensions and National Health.

Legislation: The sections of the important Acts which concern sanitary inspectors, including the Meat and Canned Foods Act, the Animal Contagious Diseases Act, the Food and Drugs Act, and the Common Carriers Act.

Provincial: General knowledge of the organization of the Department of Health of the candidate's province.

Legislation: The Public Health Act and regulations as relating to the duties and responsibilities of sanitary inspectors.

Municipality, County or District: Organization and functioning of a municipal, county or district department of health, with particular reference to the duties of a sanitary inspector.

Legislation: Pertinent local by-laws and ordinances.

Ethics

Principles and conduct in relation to the public, the medical officer of health, and other members of the Department.

REPORT OF THE COMMITTEE ON MILK CONTROL

THE purpose of this report is twofold: firstly, to present a brief review of the measures directed at the control of milk in the various sections of the Dominion; and, secondly, to outline the policies of the Association concerning milk control.

The membership of the Association includes all those in Canada who are in a position to speak with authority as to the advantages and disadvantages of scientifically sound, practicable regulations designed to ensure a safe milk supply to the consumer. While naturally concerned with the assurance to both producer and distributor of a fair return on their investment, the chief responsibility of the public health administrator is to the individual who purchases in good faith what he has been led to believe is a wholesome product.

This Association is convinced of the necessity for Dominion-wide adoption of all measures of proven value which will ensure a milk supply of standard quality, free of harmful organisms. Such measures include provincial standards for clean production, collection and distribution, and provision for such inspection and supervision as are necessary to maintain such standards. Effective measures to control changes in the chemical, physical and physiological character of milk should be carefully devised in the interest of the public.

In most of the provinces consideration has been given to many aspects of the problem. Your committee, however, recommends that the following measures be considered as fundamental in the establishment of any satisfactory provincial scheme of milk control:

Provincial licensing of all producers, collectors and distributors.

Provision for adequate inspection and supervision of the premises, plant and equipment of producers, collectors and distributors, with direction as to methods to be adopted in the conduct of all of the details of producing, collecting, processing and distributing milk.

While your committee is seriously concerned with the fact that compulsory pasteurization is not as prevalent as it should be, it is also appreciative of the difficulties of its universal adoption. They strongly recommend, however, that, when and where pasteurization is in effect, there should be not only approval of plant equipment at the time of installation but regular supervision of such equipment during operation.

THE PRESENT POSITION IN RESPECT TO THE CONTROL OF MILK IN CANADA

The situation with respect to milk in the various provinces of the Dominion is characterised by a considerable lack of uniformity in legislation, regulation, inspection and statutory objectives. In all provinces some type of legislation for the control of the milk supply is enacted but wide variations exist when it comes to the operation and enforcement of a program to safeguard adequately all interests connected with the supply.

Over the country as a whole it is uniformly conceded that the price of milk should adequately represent a fair return to both producer and distributor. The

consumer has not in all instances been seriously considered in this connection. The quality and safety of the product and supervision to ensure such have not in all parts of the Dominion received the statutory recognition that has been accorded the matter of price.

In two provinces statutory provision has been made for the appointment of boards or commissions for the purpose of regulating the price of the product, particularly with reference to the producer and the distributor. In one province (Manitoba) milk has been classified as a public utility. In one province (Ontario) the price of the product has been made the chief concern of the board set up under the provincial milk ordinance.

In order to ensure brevity with clarity, the situation at the moment in eight of the nine provinces is tabulated under appropriate headings.

Alberta

The responsibility for the control of milk in the province of Alberta is vested in the Provincial Department of Health.

Supervision is extended through the officer of the board of health of the local health district in which milk is to be sold or offered for sale. Regulations are set up by the Provincial Department of Health for the guidance of local inspectors. A measure of direction is given to certain aspects of this supervision by the provincial veterinarian.

The assumption of the responsibility for supervision is obligatory on the local health district. Licenses are granted by the local board of health to the producer, collector and distributor and the obtaining of such licenses is compulsory.

Suggested standards for grading are set forth by the Provincial Department; however, any local board may establish local standards for grading with the consent of the Provincial Department. Pasteurization is not required. The minimum butter fat content is 3.25 per cent. The maximum bacterial count is set at 100,000 per cubic centimetre. Standardization of price has not been seriously considered as yet.

British Columbia

In the province of British Columbia the responsibility for control of the milk supply is vested in the Provincial Department of Agriculture.

The provincial veterinary inspectors exercise supervision over producers. Regulations of the Department of Agriculture are set up to guide the inspector in the grading of the product. Milk is graded (A), (B), and (C). Milk graded (C) may be sold for only thirty days pending improvement. Municipalities are encouraged to establish a by-law controlling the local supply and most urban municipalities have implemented such legislation by passing municipal by-laws. The local provincial inspector exercises some supervision over the producer and, it is presumed, over the vendor, in those centres which have not adopted the local by-law.

Licensing of producers is in the hands of the provincial inspector appointed by the Department of Agriculture. Licensing of vendors becomes automatic with the passing of a local by-law and responsibility for the supervision of the vendors, premises, etc., then is assumed by the municipal inspector, who is an officer of the local health department.

Compulsory pasteurization is provided for in the statute but is not common.

The quality of the milk in terms of butter fat content is fixed at 3.25 per cent. The maximum bacterial content is fixed by provincial regulation in all centres in which a local by-law is in effect; this varies according to the classification of milk sold.

Provincial authorities have given consideration to the fixing of milk prices.

Manitoba

The control of milk is vested in the Public Utility Board aided by the Provincial Department of Health, which supplies the personnel for sanitary supervision.

The Public Utility Board has all the requisite authority to set up the standards governing production, collection and distribution. Supervision with respect to these standards is carried out by officers designated for the purpose by the municipal or Provincial Health Departments. Both producers and distributors are licensed by the Board.

No reference to pasteurization is made in either the governing legislation or regulations.

Standard milk must have a butter fat content of 3.5 per cent. Prices for all grades of milk are fixed by the Board. It is presumed that the bacterial content is considered in the milk grading.

New Brunswick

The control of milk is vested in the Provincial Department of Health. Supervision according to regulations passed by the Provincial Department is province-wide in its application and is carried out by the officers of the provincial sub-health district. In certain of the larger urban municipalities a large measure of local control is exercised. Licensing of both producers and distributors is compulsory. Pasteurization is optional, compulsory pasteurization existing in only one municipality, viz., Saint John.

The minimum butter fat content of the milk offered for sale is set at 3.25 per cent. There is no reference in the regulations to standardization of bacterial count. The price of milk is fixed by agreement between the producer and the distributor.

Nova Scotia

The responsibility for the control of milk is vested in the Provincial Department of Health.

Municipalities may assume control of the milk supply from all sources to their particular area. Supervision in that event is extended by the medical officer of health or by inspectors appointed by the local board. The standards for such supervision are laid down by the Provincial Health Department. Licensing of producers and distributors is required. Pasteurization is provided for in the statute and is in effect in some instances.

The butter fat content is fixed at a minimum of 3 per cent. A maximum bacterial count is also set up.

There is no reference to price fixing in the provincial legislation.

Ontario

Production and sale of milk are controlled by the Department of Agriculture through the Milk Control Board of Ontario. Supervision as to sanitation and quality is the responsibility of the local boards of health. Consultant service is offered to local boards by the Provincial Department of Health. The assumption of such supervision by the local municipality is optional and is provided for by local by-laws. All producers and distributors are licensed by the provincial Milk Board.

While every effort is made to establish compulsory pasteurization by the Provincial Department of Health, the responsibility for putting such control measures into effect is dependent on the local authorities by the passing of local by-laws.

In all municipalities in which a local milk by-law is in effect the mik must contain 3.25 per cent butter fat. The bacterial content of milk offered for sale is not fixed except in cases of certified milk. The price to both producer and consumer is fixed by the Milk Control Board.

Prince Edward Island

The responsibility of milk control rests with the Provincial Health Department.

The two larger urban communities assume the responsibility for regular inspection of the supply, extending supervision both to the farms of the producers and to the plants of the distributors. A form of licensing of producers is in effect.

Optional pasteurization is carried on in one large urban centre; approximately 75 per

cent of the supply is treated in this fashion. There is no present sympathy for compulsory pasteurization. However, compulsory tuberculin testing, with the accompanying disposal of infected cattle, is provided for, subject to federal regulations.

Quebec

Direction in respect to the control of fluid milk in the province of Quebec is assumed by the Provincial Bureau of Health. Responsibility, however, for supervision of the farms of producers is jointly shared by the Provincial Bureau and the officers of the health department in the municipality in which the milk is sold. A very complete method of scoring such plants is in effect.

Desirability of pasteurization is urged and the Provincial Bureau has a large measure of fixed authority in respect to such plants.

Consideration is being given at the moment to regulations which will be province-wide in their application.

Saskatchewan

The provincial Department of Public Health assumes the responsibility for initiating such statutory and regulatory measures as are designed to ensure a satisfactory milk supply in the province. Legislation recently enacted supplements provision previously made for tuberculin testing by granting municipalities the authority to provide for the compulsory testing of cattle for infectious abortion and other diseases of animals possible of spread to humans.

An interesting amendment to the Public Health Act of the province adds to the authority already granted the supervision of milk used for human consumption from privaely owned cattle.

Changes in the regulations which make for the more practicable operation of suggested control measures are in the process of being enacted.

W. J. BELL, *Chairman.*

REPORT OF THE COMMITTEE ON THE SEAL OF THE ASSOCIATION

AS instructed by the Executive Committee, the historical records of the Association were carefully examined to learn if steps had been taken at any time to prepare a seal for the Association and, if not, to make the necessary arrangements to correct this omission. Suggestions for a design were received from several members of the Association. Through the kindness of Miss Maria T. Wishart, Director of Medical Art Service, University of Toronto, the work of preparing a design was undertaken by Mrs. L. R. Thomson, formerly of the medical art department of McGill University. The committee is deeply indebted to Miss Wishart for her interest and to Mrs. Thomson for the preparation of the Association's seal. The committee believes that the new seal is dignified and expressive of the work and purposes of the Association.

Your committee places the seal for formal adoption at this meeting.

R. D. DEFRIES, *Chairman.*

LETTER FROM GREAT BRITAIN

GEORGE F. BUCHAN, M.D., F.R.C.P., D.P.H.
London

THE SILVER JUBILEE

THE Silver Jubilee of His Majesty King George V, which has been a time of great rejoicing in London, has not passed without the recognition by the King of the importance of medicine. On Monday, 13th May, 1935, the King and Queen drove from Buckingham Palace to Hammersmith to open the British Post-Graduate Medical School. Sir Hilton Young, the Minister of Health, was with the King and Queen in the royal car. Their Majesties were received by Sir Austen Chamberlain, Chairman of the Governing Body of the School, and Lord Snell, Chairman of the London County Council, and the Earl of Athlone, the Chancellor of London University. The King, after referring to the great pleasure with which he and the Queen had come to perform the opening ceremony and to his own gratitude for the skill and care which he had received from the medical profession, stated: "It is my earnest hope that this school, with its happy union of ward and laboratory, university and local authority, drawing students and teachers alike from all parts of our Empire, and, I trust, from regions even more widely spread, may prosper under God's blessing. May it play an imperial role in the winning and dissemination of medical knowledge, in the relief of suffering among my peoples in this country and overseas, and in enabling the doctors of all lands to come together in a task where all must be allies and helpers."

THE NEW CHIEF MEDICAL OFFICER

ARTHUR SALUSBURY MACNALTY, M.D., F.R.C.P., D.P.H., has been appointed to succeed Sir George Newman, K.C.B., as Chief Medical Officer of the Ministry of Health and Board of Education. Dr. MacNalty has been a medical officer in the service of the State for more than 20 years. He had a distinguished career at Oxford and before entering the Civil Service held many valuable hospital appointments. He possesses the essential qualification for sound public health work in that primarily he is a physician. His early interests were physiology and tuberculosis and it is difficult to imagine a better combination of subjects for a sure public health foundation. Dr. MacNalty had also general county public health experience before he entered the medical department of the Local Government Board in 1914.

Dr. MacNalty's career in the central government department has been one of great distinction. He has produced a number of epoch making reports, of which the outstanding is his report to the Ministry of Health on tuberculosis, including an examination of the results of sanatorium treatment, published in 1932. This work shows a complete mastery of the subject and is one which is likely to be used as a handbook of constant reference by all who are dealing with the problem of tuberculosis in any capacity. Another piece of work by which Dr. MacNalty has come into great prominence has been his investigations into the epidemic diseases of the central nervous system. His published writings in regard to these diseases are classical and his book on the subject published in 1927 is a valuable addition to medical literature. During more recent years Dr. MacNalty has been in charge of the tuberculosis, venereal disease and institutional therapy section of the Ministry of Health. In this position his advice has been greatly sought and valued by all medical officers dealing with these aspects of public health either in this country or abroad.

Apart from his departmental ac-

tivities, Dr. MacNalty is a distinguished member of the medical profession. He has served on many important committees of the Medical Research Council. He has also been an Examiner in Public Health to a number of English universities. In this way he has kept himself in touch with the younger men who are entering the service, while in his everyday work he has been in touch with all who are actively employed by the various local authorities of England and Wales.

Dr. MacNalty succeeds a great man and a great personality but his record of work eminently fit him for the high office which he now holds and those of us who know him are looking forward to still greater achievements. Dr. MacNalty is a sound medical man, a brilliant investigator, with first hand experience of the public health work of local authorities and an intimate knowledge of the work of his own department. In his present appointment he will be able to advance the science and practice of preventive medicine along sound lines and we of the public health service in England know that he will diligently pursue this arduous task. Dr. MacNalty is greatly gifted and well equipped, intellectually and professionally. He has ability and industry and above all sound commonsense, tact and judgment, which will greatly add to the authority of his advice. He is assured of the support and confidence of the English public health service. To those of my Canadian colleagues who may not know Dr. MacNalty, let me say that they will always get from him a hearty welcome on any occasion on which they may visit this country and that they will find in him a man of great charm and kindly and genial personality.

MATERNAL MORTALITY

ALTHOUGH this subject is often written about, I feel that I am justified in referring to it on account of its general importance and the extent to which it occupies the public mind. Only recently I presided at a meeting of the Royal Sanitary Institute at which it was discussed by Eardley Holland, M.D., F.R.C.S., F.R.C.P., Obstetrical and Gynaecological Surgeon to the London Hospital, and R. Veitch Clark, M.B., B.Sc., D.P.H., the Medical Officer of Health of Manchester. The remarkable thing about the opening papers was that although the subject was approached by Mr. Eardley Holland from the point of view of the consultant obstetrician and by Dr. Veitch Clark from the public health point of view, they both came to the same conclusion, which in effect was that some system of whole-time service of midwives required to be inaugurated in this country. At the present time only a very small proportion of midwives are employed whole-time, by far the greater proportion being what is called "pin money" midwives, that is to say, women who are certified midwives and who practise midwifery only for the sake of the extra money that it brings them.

There were some points particularly in Mr. Eardley Holland's address which merit very special attention. Mr. Holland emphasised that the failure of the maternal mortality rate to yield one decimal point to the sustained attack which has been directed against it is particularly disturbing especially when it is remembered that the English mortality figure is about 40 per cent higher than that of the Netherlands, a country whose statistical methods in this respect are very comparable with our own.

Ineffective Measures So Far Taken. The methods by which the problem has so far been attacked may be thus summarised: (1) the training of midwives has been progressively raised from three months to twelve months; (2) there has been a great improvement in the practical teaching of

medical students; (3) the public health authorities have been very active; the Notification of Births Acts and the Maternity and Child Welfare Act were placed in the Statute Book, and welfare centres, ante-natal clinics, and hospital beds have been provided; (4) the number of maternity beds in the voluntary hospitals has been increased; (5) the principles of aseptic and antiseptic technique have been disseminated widely; (6) ante-natal care has been developed in principle and extended in practice; (7) the Ministry of Health has issued notable Reports; (8) research work has been done on every aspect of the subject. This is a remarkable record of high endeavour but it has had no effect on the maternal mortality rate. Everything has in fact been done but the one essential thing—the necessary personnel has not been trained, and until this is done there is not the slightest chance of victory. So says Mr. Eardley Holland.

Information Available. The two most impressive documents which have been issued lately are the Interim and Final Reports of the Departmental Committee of the Ministry of Health in 1930 and 1932 and the Report issued by the New York Academy of Medicine in 1933. Both reports have very many points in common and both are agreed that at least half of the maternal deaths are preventable. It is interesting to observe that the final Report of the Ministry of Health comes to this significant conclusion: "We are, however, convinced that the primary essential for the reduction of a high maternal mortality is sound midwifery, before, during and after childbirth, and this does not chiefly depend upon administrative arrangements or the expenditure of public money."

Intervention during Labour. Mr. Eardley Holland points out that there has been a remarkable widening during the last 15 to 20 years of the indications for intervention during labour and a great increase in operative deliveries. The chief responsibility for this is probably associated with the following: (a) the widespread use of analgesics and anaesthetics which often slow down and lengthen labour and weaken the natural forces, thereby increasing the forceps-rate; (b) the building of many little cottage and other hospitals giving to local practitioners, who may possess neither the requisite judgment nor skill, the opportunity of performing Caesarean sections and other obstetric operations; (c) uninstructed ante-natal work with its mistaken notions and resort in consequence to unnecessary operations; (d) interference with the course of normal pregnancy and labour on account of the importunity of the patient and her relatives or for the convenience of the doctor or nurse; (e) an exaggerated idea of the value of the life of the infant as compared with the life or health of its mother.

The Experience at Rochdale. Rochdale has had one of the highest mortality rates in England for many years. During the three years 1929-1931 it was 10 per 1,000. A study of the circumstances leading up to each death indicated that a large proportion of the deaths had probably been due to too frequent intervention in the course of labour by the medical attendants. The problem was how to stop this. The support of the medical profession and midwives was easily obtained when enlightened to the true state of affairs. The interest of the community in the medical facts was awakened through the agency of the pulpit, the platform and the press. The women were thus taught to safeguard themselves, to make use of the ante-natal clinics, to report the first signs of any abnormality and to refrain from importuning the doctor or midwife to act contrary to their best judgment

in hurrying the course of labour. The result was remarkable. The "drive" began in 1931. For the three years 1932-4 the maternal mortality of Rochdale had fallen from 10 per 1,000 to 3.9 per thousand. Of course the figures for Rochdale are small but even so the result appears to point to the need for less frequent intervention in a very large proportion of midwifery cases. Arising out of the Rochdale figures and the experience generally it may be fairly safe to say as Mr. Eardley Holland says, that to reduce the mortality in areas where it is high is easy and requires no change of personnel and no additional expense, but to reduce the mortality to a figure below the existing best can only be done by a radical change of personnel. A personnel cannot be improvised, but must be trained. This will need the building and staffing of the requisite training schools. In Munro Kerr's words, "Holland's death-rate is low primarily because of the excellence of its obstetric service." The problem of maternal mortality is not obscure, and the lowering of maternal mortality will not be difficult with the proper personnel. The mistake that the central and local authorities of this country appear to be making is in believing that the creation of an efficient obstetric service is simply an administrative problem.

BOOKS AND REPORTS

Blood Groups and Blood Transfusion. By Alexander S. Wiener, A.B., M.D. Published by Charles C. Thomas, 220 East Monroe Street, Springfield, Illinois, 1935. 220 pages, illustrated. Price, $4.00.

In clinical medicine there is no more dramatic procedure than blood transfusion. Since the first authentic blood transfusion by Richard Tower in 1665, the developments in this field have been outstanding. Dr. Wiener's book, therefore, serves a real need in bringing together upon an historical background the recent advances in theory with a description of technique adequate for practical purposes.

The author has accomplished a difficult task admirably. All phases of the subject of blood groups and blood transfusion are included. The essential facts concerning individual differences in the blood and the practical application of those facts in biology, and clinical and forensic medicine are of fundamental interest. The sections on technique and transfusion are highly informative. Dr. Wiener's foresight is further shown in his method of presenting his material on heredity of the blood groups. He carefully elaborates the fundamental principles of genetics and biometrics of which he subsequently makes use. Students of these sciences will find this portion of the book, including the chapter on anthropological investigation on the blood groups, therefore, of great value.

The medico-legal applications of blood grouping are considered in a final chapter, with particular reference to affiliation cases and identification of blood stains of human origin. A companion bibliography throughout adds further to the value of the volume.

The author has done a real service in presenting this book. The tremendous advances in science in the last quarter-century can only be adequately bridged for most of us by such clear expositions as this one. In this volume, Dr. Wiener offers a valuable contribution to the scientific bookshelf —for the medical profession and the biologist; for the teacher, the clinician and the student alike.

A.H.S.

Manual of the Diseases of the Eye. By Charles H. May, M.D. Fourteenth Edition, revised. Published by William, Wood and Company, Baltimore, 1934. 496 pages, 375 illustrations, including 25 plates. Price $4.00.

May's well-known manual has passed through fourteen editions and many reprints since the beginning of the century and has been translated into many languages. These facts alone should recommend it.

The general practice of medicine is the practice of all specialties, and this book is primarily for students and general practitioners. In spite of this it deals more thoroughly with the various aspects of the subject than many larger and more expensive texts. It is an indispensable book.

G.W.

CURRENT HEALTH LITERATURE

These abstracts are intended to direct attention to articles that have appeared in other journals during the past month. Any of the journals referred to may be borrowed for three days or longer if desired. Address requests to the secretary of the Editorial Board.

Amoebic Dysentery in New York City

This study demonstrates a marked increase in the number of cases of amoebic dysentery diagnosed in New York City in recent years. In 1929 there were only 2 cases, in 1930 there were 19, in 1931 and 1932 there were 20 in each year, and in 1933 there were 89 cases. These figures include all forms of the disease, but between November 1, 1933, and September 30, 1934, there were 121 cases of the amoebic form alone, 64 of them between the ages of 30 and 50 years.

The conclusions are that amoebic dysentery is probably always present in the city, that much of it originates outside the city, and that the amount of foreign origin, though not great, appears to be steady and constant. Further, the Chicago outbreak in August-October, 1933, was responsible for at least 73 New York cases and probably many more, and the infection is grave, the case fatality rate among the 121 referred to above being 14 per cent.

R. Olesen and J. Rosenbluth, U.S. Pub. Health Rep., *50*: 37, 1935.

Housing Problem in a Southern City

Following improvements in the water supply the typhoid death rate of Memphis, Tennessee (population 253,000), fell rapidly but there still remained a relatively high death rate with a greater concentration of deaths in the summer months than in early decades. In an effort to explain this persistence, a study of housing conditions was carried out and related to the typhoid death rate and infant mortality rate.

The highest of both rates was found among the negroes in the slum areas. Typhoid case rates for negroes within the slum area were higher in those wards in which the greater part of the population was without private lavatories. Infant mortality showed no such relationship. The various wards were also ranged in order on a basis of housing indices taking into account persons per room, percentage of dwellings in ill-repair, and percentage of persons with outdoor lavatories. Both for whites and negroes the typhoid and infant mortality rates were higher in the districts with the lowest indices. A distinct correlation between the rates of white and coloured persons is apparent in the wards, though the percentage of outdoor lavatories amongst the whites is negligible in all wards.

It was suggested in the discussion that the unscreened houses and communal lavatories were fly-infested, which would result in equal infection amongst the population with and without private lavatories and be reflected in infant mortality through, especially, diarrhoca and enteritis.

L. M. Graves, and A. H. Fletcher, Am. J. Pub. Health, *25*: 21, 1935.

The Diagnosis of Trichinosis

This article, which provides an extensive bibliography, is an analytical report of 35 sporadic cases of trichinosis occurring in and around Boston, Mass., during the past three years. The most reliable diagnostic aid is the incidence of an eosinophilia, although they believe that the skin test, which usually becomes positive about 17 days after infection, and the precipitin test which is recognizable at the end of the 4th week, are of special value as a diagnostic aid. Mild, sporadic and chronic cases of trichinosis were often selected only by these tests. Procedures such as examination of the stool for the adult parasitic forms, as well as blood and spinal fluid examinations for larval forms, are time consuming and seldom yield confirmatory findings.

W. W. Spink and D. L. Augustine, J.A.M.A., *104*: 1801, 1935.

Influenza: Experiments on the Immunization of Ferrets and Mice

The main object of this work is the development of some practical method of immunization against epidemic influenza that can be applied to man.

Ferrets after recovery from infection with influenza virus are completely resistant to reinfection for at least 3 months; thereafter the immunity slowly wanes. The waning immunity can be reinforced by subcutaneous inoculations of living virus so that once more the ferret becomes completely resistant. A partial immunity is produced in ferrets by subcutaneous inoculations of living or formalized virus. Similar immunization of mice with living virus has a beneficial effect upon the extent and course of the disease.

Wilson Smith, C. H. Andrews, and P. P. Laidlaw, Br. J. Exp. Path., *16*: 291, 1935.